ENGINEERING NEWS

THE BARTLETT WATER SUPPLY project was formally presented to the city of New York on Nov. 30. Briefly stated, this proposal to furnish 50 million gallons daily of water to lower New York, under a head of 300 ft., comes from a syndicate of corporations in New Jersey. The water is to be gathered from the 877 sq. miles of Passaic river water-shed, stored in a reservoir at the Great Notch near Paterson, N. J., and is to be led by pipes and tunnel under the Hudson river directly to lower New York. The advantages claimed are—abundant supply by gravity, constant fire-pressure, sales of water by the city for motive power, the saving of great mains from the Central Park Reservoir down town, and the preservation of the Croton supply for upper New York and the annexed districts. The syndicate promises a supply within 3 years from date of contract, and will charge the city $75 per million gallons, payable quarterly. The project is endorsed by responsible parties. In a later issue we will give the plan in fuller detail.

THE ERIE CANAL, just closed for the year, did a business in 1887 of over 5,500,000 tons, while for 1888 it will hardly reach 5,000,000 tons. The reduction is due to several causes; the holding back for higher rates by the boatmen, and a consequent diversion of traffic to the railroads; the raise in storage rates by the elevator men, and generally light exports. The double-header boats claim to lose time at the locks not yet lengthened, and insist upon it that the capacity of the Erie can not be increased until all the locks are lengthened.

THE ANNUAL REPORT OF THE SECRETARY OF THE NAVY has been issued, and it gives a comparison between the condition of the service as it was in 1885 and will be in 1889. At the beginning of the period the policy was adopted of obtaining all supplies in this country, and no armor or gun steel has been purchased abroad since 1885; efforts to start the manufacture of armor and heavy guns have resulted satisfactorily. The designs for the machinery for which contracts had been let in 1883 were found to be too far behind the age, and that only an average of 2¼ indicated H. P. per ton of machinery could be expected. After investigations of the question of the power of machinery, it was decided that the machinery of naval vessels ought to be so designed as to give 10 H. P. per ton of machinery, and this has been adopted as the standard. A 6-pounder gun by the Driggs Ordnance Co., and the steel cast guns received from the Pittsburg Steel Casting Co. and the Standard Steel Casting Co. have been finished and sent to the proving ground. The importance of torpedo boats is referred to, but it is stated that no submarine boat yet tried can be considered as satisfactory. The destructive work of cruisers as evidenced during the Civil War, is shown by the statement that the total tonnage of the registered vessels of this country had risen to 2,642,628 in 1861, but by 1865 it had been reduced to 1,492,926 tons, or the same as in 1849, "from which decline we have never recovered."

A NEW YORK CENTRAL bridge was run into last week by a derailed locomotive, and the end post and floor quite seriously damaged, but it did not fall and no permanent harm was done either to the bridge or the train. It was a riveted lattice, but we have not received full details of the occurence, which escaped record in the daily press.

A ROTARY STEAM SNOW SHOVEL is said to have been ordered for the New York Central road. This is the first eastern road to adopt this snow shovel, which has met with such signal success in the West for four or five winters. With this machine added to the equipment of the road, we shall probably hear less of delays to mails and passengers by snow blockades on this line during the present winter.

JERSEY CITY'S new water supply is being discussed at "citizens' meetings", and the opportunity has not been lost by the chronic crank. The bone of contention is a proposition to furnish water, made by a private corporation, a part of the Bartlett syndicate. Last Monday's meeting was marked by a free fight in an attempt to eject a party who interrupted the syndicate attorney and defied the presiding officer; in this fight tables and chairs were smashed and the club of a policeman alone stopped the row. At a preceding meeting, threats were made of hanging to a lamp-post the promoters of a private contract. It is to be hoped, for the good name of the city, that these proceedings will be brought to an end by the more reputable and intelligent citizens calmly discussing what is really a great public need, and taking such action as will improve the present supply, whether this improvement comes from works of their own building or from a private corporation.

AN ENGINEERS' CLUB was organized on Tuesday evening at the rooms of the American Society of Civil Engineers, by a number of gentlemen interested with the object of drawing more closely together those engaged in the kindred pursuits of engineering. The incorporators are: JAMES A. BURDEN, H. R. TOWNE, J. C. BAYLES, A. C. RAND, DAVID WILLIAMS, B. S. CHURCH, EDWARD COOPER, THOS. EGLESTON, W. G. HAMILTON, J. F. HOLLOWAY, W. A. PERRY, J. C. PLATT, R. W. RAYMOND, and F. S. WITHERBEE. Its present officers are: JAMES A. BURDEN, President; H. R. TOWNE, and JAMES C. BAYLES, Vice-Presidents; A. C. RAND, Treasurer, and DAVID WILLIAMS, Secretary. The responses received at an earlier stage of the movement encourage the belief that the new club will start with a large and representative membership. A circular is soon to be issued to members of the three great engineering societies, inviting their co-operation and placing before them the details. We may state that engineers residing within 150 miles of New York are eligible to membership, the initation fee being $50, and the annual dues $35. For non-resident members the admission fee is $50 and the annual dues $20. It would seem as if the time had come when such an organization was needed, and could be made successful.

WIND PRESSURE ON THE FORTH BRIDGE was originally provided for in the calculations to the extent of 56 lbs. per sq. ft. In the recent severe storms of last month the greatest recorded pressure was 27 lbs. per sq. ft. on the large wind gauge, which has 300 sq. ft. of area and is fixed on Inch-Garvie square to the east and west. On a small fixed gauge, of 1⅛ sq. ft. area, the maximum pressure at the same time was 41 lbs., and on a board of the same size but pivoted so as to turn square to the wind, the pressure was 35 lbs. The wind coming as it did from the S. W. did not strike the fixed board squarely. On other parts of the bridge the average pressure was 32 lbs. per sq. ft. At the late meeting of the Iron and Steel Institute, Mr. COOPER, Principal Asst. Engineer of the Forth Bridge, said that the highest pressure in the preceding 2½ years had been 19 lbs. per sq. ft. on the large board, and 38 and 32 lbs. on the two smaller boards. This large board has two gauges, one in the upper right hand corner and the other in the center; and when the pressure was 19 lbs. over the whole board, the middle maximum 32½ lbs. and the corner pressure was 28 lbs. Mr. COOPER and his associates contend that the larger the structure, the smaller is the average wind pressure, and their observations carry out this assumption.

THE AQUEDUCT COMMISSIONERS have continued hearings on the question of whether the Quaker Bridge Dam should be built at all or not, to which they are limiting their present inquiries; a strong opposition in intensity, but confined to very few individuals, being developed. The burden of the arguments against the dam so far advanced, seem to be that 200,000,000 gallons per day can be obtained by various other devices without building the dam and that will suffice for immediate necessities; a fact which would hardly seem to require elaborate arguments to establish, since there is probably no one who disputes it. The real question is rather: How long will it be before much more than that quantity will be required and what is to be done then. A strong argument could be and was made against building either the dam or the new aqueduct, before either was begun; but the aqueduct being built, the dam follows as a logical sequence, and we have no doubt will be built.

THE TREMONT METER CO., of Boston, asks from City Councils "a full and impartial inquiry" into its dealings with the city of Boston. But it asks that this inquiry be free from political influence This looks like a reasonable and proper proceeding. Either the company, through official connection, has been guilty of imposition upon the Boston taxpayers—or it has been terribly lied about. In either case an honest investigation will do good.

THE NEW CROTON AQUEDUCT is to be finished by Dec., 1889, according to a statement made at the Commission meeting of Nov. 30. Brown, Howard & Co. denied that they had stopped work on the aqueduct. They have reduced their force, however, to 160 men.

THE MOST SERIOUS RAILWAY ACCIDENT of the week was a head collision Dec. 5 between a mixed and a freight train on the Sharon branch of the Lake Shore & Michigan Southern near Youngstown, O. One man was killed and 3 were injured, 2 of them fatally. It is said that the engineer of the freight train heard the passenger train, but supposed it was on the adjoining track of the New York, Pennsylvania & Ohio.——Another serious accident, resulting in the death of 3 train men, was a collision, Dec. 3, in the Grand Trunk freight yard at Merriton, Ont., between a coal train and an engine which was taking water at a tank. The verdict at the inquest was to the effect that sufficient brakes were not applied, and that the driver did not reverse his engine or whistle for brakes till too late. As a precaution the jury recommended that an extra brakeman be placed on trains down the grade to the yard, and a switchman at the Welland main line switch. Had one been there, he could have run this train down the Welland main line and averted the collision.

TWO RAILWAY VELOCIPEDES on the Old Colony were run into Dec. 2. In one case a signal light tender was killed by a light engine, and in the other a track patrolman was killed by a construction train.

As a train of coal cars was being pulled up No. 1 plane of the Delaware & Hudson Gravity Railway, on Nov. 29, the cable broke; the train ran back to the foot of the incline and dashed into a number of cars standing there. About 12 cars were totally wrecked and the coal thrown over the workmen, none of whom were injured.

THE CAST STEEL GUN, made by the Pittsburg Steel Casting Co., burst at the second test at the Annapolis proving grounds on Dec. 5. The first charge was 36 lbs. and the second was the regulation 48 lbs. with a 100 lb. conical shot. The gun was 16 ft. 1 in. long, and weighed 10,000 lbs. It was shattered from the trunnions to the butt into 20 pieces, showing the greatest weakness at the breech. The bursting pressure showed 14 1-10 tons per sq. in. While this failure is to be regretted, it does not at all follow that "it proves that Bessemer steel will not do for great guns", to quote words of one of the officers in charge of the test. It is a first test of a practically new process, and if it proves anything, it is that the gun must be made stronger by improving the qualities of the material and remodelling. A similar verdict, if carried out, would have deprived us of the use of the Rodman cast-iron guns of heavy calibre that did such excellent service in our late war.

A COUPLING ROD of an engine on the Atlantic City express of the Philadelphia & Reading, broke on Dec. 2, and the sudden strain caused the rod on the other side to break its crank-pin. The cab was wrecked, but neither of the enginemen were hurt.

THE FOLLOWING BRIDGE ACCIDENT is reported: On Nov. 28 the storm washed away the Old Colony Railroad bridge below the station at South Braintree, Mass.

THE SWITCHMEN'S STRIKE at Indianapolis, Ind., for an increase of wages, has fortunately been terminated without serious difficulty. The companies found plenty of men anxious to take the vacant places, and on Dec. 4, the strike was declared off. The switchmen relied on securing the coöperation of the brakemen, engineers and firemen to enforce their demands; and when this resource failed, acknowledged their defeat.

Engine-House and Water Tower of the Water-Works of Leyden, Holland.

Though Holland is perhaps of all countries the most abounding in water, the Dutch cities nevertheless suffer much from the need of water of a potable character. The water supply of Leyden, like that of Amsterdam, is obtained from the sand dunes lining the shores of the North Sea. These dunes form natural conservators of the rainfall, but the water must be filtered before it can be used for domestic purposes.

To collect this water, trenches are dug in the base of the sand-hills and these are connected together by canals leading to a common reservoir from which the water is pumped after first being filtered.

The illustration given shows the water tower and pumping station at Leyden, in which the machinery tank and living rooms of the operative are all combined under one roof. The tower has an exterior diameter of 52 ft. and the walls are 2.50 ft. thick at the bottom and 1.47 ft. thick at the top. This outer wall, along with a central stair tower 10 ft. in diameter and with wall 1.11 ft. thick, supports an iron tank above which, furnishes the necessary quantity and head of water. This tower is founded directly on the sand of the dunes; though by excavating deeper a firmer soil could have been found. The foundations of the pumps are made of brick laid in hydraulic cement almost on the surface of the sand.

Fig 1

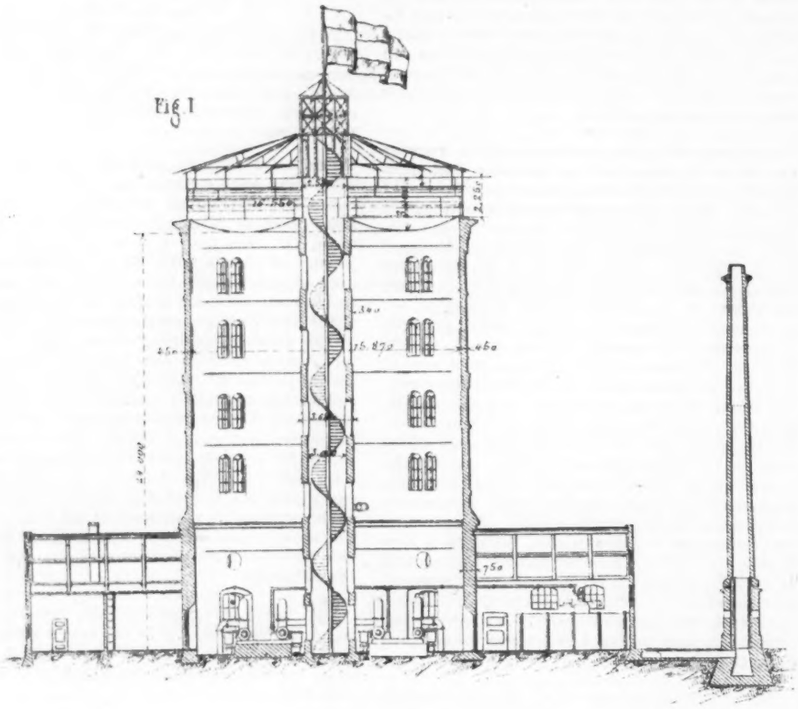
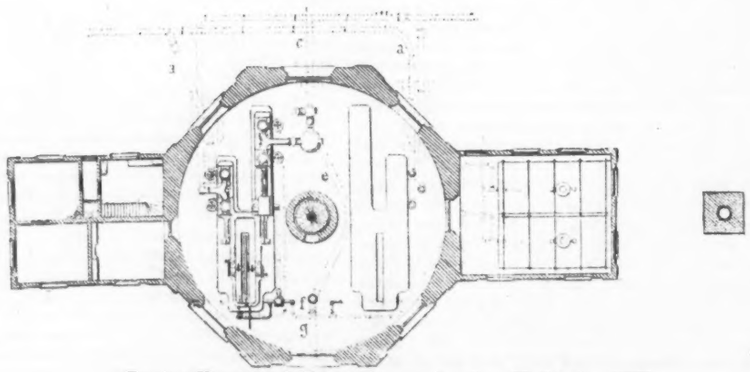


Fig 2.



Engine-House and Water Tower; Leyden, Holland.

The iron reservoir has a diameter of 54 ft., with an open central shaft about 9 ft. in diameter. Its height is 7.4 ft. at the external walls and 10 ft. at the central shaft. The lowest point of this reservoir is 80 ft. above the floor of the engine-room and about 100 ft. above the street level of Leyden. Its capacity is 148,000 U. S. galls. An iron roof covers the reservoir and at the same time reduces evaporation. The price of water furnished to Leyden is about 10 cts. per 1000 galls., as measured by a meter.

Boston Heating Company.

This company is extending its plant by the erection of an additional station adjoining the building erected last spring, a full illustrated account of which was given, Nov. 12, 1887, in these columns. The new building is 110 x 66 ft., connecting with the old building in the rear, and is of equally solid masonry construction. New boilers are being set as fast as they can be delivered. The capacity is sufficient for 14 boilers of 500 H. P. each, or a maximum capacity of 650 H. P., thus furnishing when completed, about 9,000 additional H. P. Two new pumps are to be erected in the old building. The outgoing pump will have a capacity of 1,000 galls. of water pumped into the circulation per minute.

The pipe system is being extended through Federal Oliver, Kilby, State, Pearl and Purchase Sts., making with the previous piping about 5 miles of mains, which supply not only the territory shown by map in our previous accounts, comprising a large portion of the central business section of the city, but outside these limits for a distance of several hundred feet.

It is said the loss of heat by radiation from the pipes since they have been operated has proved to be less than 5 per cent., which is probably much lower than the losses which occur in the use of steam mains laid in the streets by other plans. The company has had about 50 takers, and this number will be doubled for the coming winter. Besides the heating of stores, warehouses, etc., the hot water, supplied under pressure at 400° to 450° is employed, by means of a converter which allows it to expand into steam, for the running of elevators, steam engines for power purposes, printing presses, etc.

The cost of the service to consumers is said to be somewhat lower than the market rates for steam in Boston, or 60 cts. per sq. ft. of radiating surface for the entire season, at 10 hours per day.

The charge for heating by this company is 50 cts., and for power, $90 per H. P. for 300 working days of 10 hours each.

In addition to the protection of the pipes by a covering of asbestos felting and inclosure in a double brick conduit, having confined air-spaces, the new constructions are to have the conduits filled with asbestos fibre.

Railroad Gauges of the World.

From a comprehensive review of the history and development of the railroad gauges of the world, the following particulars in regard to the gauges of the world are extracted. It was agreed in England about 1848 that a uniform gauge of 4 ft. 8½ in. should be used on all new roads, except those already served by 7 ft. gauge. The first German road, from Nuremberg to Fürth, was built with 4 ft. 8½ in. gauge, which is now used by all the principal roads of Germany, although there is a very considerable mileage of narrower gauges, mainly 1 metre, or 3 ft. 3⅜ in. France started her roads with a width between rail centers of 4 ft. 11 in., which has led to some slight variations of gauges, according to rail width. The later roads have been built with a gauge of 4 ft. 8½ in. Holland began with a 6 ft. 4 in. gauge, but has now altered all its roads to 4 ft. 8½ in. The Railroad Congress at Berne, in May, 1886, adopted the following resolution, which is to apply to Germany, Austria-Hungary, France, Italy, and Switzerland:—"The gauge of railroads measured between the inner edges of the rail heads shall, for roads built or altered as to gauge after this resolution takes effect, not be less than 4 ft. 8⅝ in. on straight lines, nor more than 4 ft. 9⅝ in. on curves."

In Russia, the first road opened in 1832, from St. Petersburg to Zarskoe-Selo, about 16 miles, had a 6 ft. gauge. When the second road was made in 1842, from St. Petersburg to Moscow, the Czar at the instance of our countryman, Major WHISTLER, fixed the Russian gauge at 5 ft., which increase over the English gauge was thought desirable for locomotive purposes. Major WHISTLER thought as wide a gauge as 6 ft. uncalled for. The 5 ft. gauge has continued the standard in Russia; but that it was not made different from the German gauge for military reasons seems to be proved by the fact, instanced by Herr CLAUS, that the lines built under imperial direction from Warsaw to Vienna, and from Warsaw to Brombourg—the Berlin line—were carried out with the German gauge.

Ireland has a standard gauge of 5 ft. 3 in.; Spain and Portugal, 5 ft. 6½-in.; Sweden and Norway have the 4 ft. 8½-in. gauge over the majority of their railroads, but 20 per cent. of the Swedish roads have other gauges varying from 2 ft. 7½ in. up to 4 ft.: Norway has 592 kilos. of standard gauge, and 970 kilos. of 3 ft. 6-in. gauge.

In Asia, of the British-Indian roads, with a collective length of 12,366 miles, about 7,450 miles have a gauge of 5 ft. 5½-in., the remainder being divided among 6 gauges from 2 ft. to 4 ft. Of the narrow gauges, the most prevalent, embracing 4,200 miles, is the metre, 3 ft. 3⅜-in. The Ceylon railroads have the standard Indian gauge. The Russian Trans-Caspian lines have the Russian standard gauge of 5 ft. In Asia Minor, the line Mudania Brussa has a gauge of 3 ft. 7¼-in. The island of Java has 449 miles of 3 ft. 6 in. gauge, and 126 miles with 4 ft. 8½ in.

In Japan, with the exception of an 8-mile piece be-

gun in 1885, with a gauge of 2 ft. 9-in., all the roads have a 3 ft. 6-in. gauge.

In Africa, the Egyptian railroads, amounting to 932 miles, are of the 4 ft. 8½-in. gauge. Algiers and Tunis, with 1,203 miles, in 1884, had the 4 ft. 8½-in. standard on all except 155 miles, which had a 3 ft. 7¼-in gauge. The English Cape Colony had, in 1885, 1,522 miles, all of 3 ft. 6-in. gauge.

In America, apart from the comparatively small mileage of United States roads with 3 ft. gauge, practically the whole of the United States and Canadian railroads are of 4 ft. 8½-in. to 4 ft. 9 in. gauge. In Mexico, in 1884, 2,083 miles were 4 ft. 8½-in. and 944 3 ft. gauge. In Brazil, at the end of 1884, there were 869 miles of 5 ft. 3 in. gauge, and 4,164 miles of various gauges between 2 ft. and 4 ft. 7-in., over 3,700 miles being 1 metre, or 3 ft. 3⅜-in., so that this may be considered the standard gauge of Brazil.

In Australia the different colonies, rather singularly, have different gauges, that of New South Wales being 4 ft. 8½-in.; Victoria, 5 ft. 3-in.; South Australia, 5 ft. 3-in. and 3 ft. 6-in.; and the other colonies 3 ft. 6-in.

The total mileage in operation in the world at the end of 1885 was 303,048 miles. Of this length 74 per cent. were of the 4 ft. 8½-in. to 4 ft. 9-in. standard, 12 per cent. had larger gauges, and 14 per cent smaller.—*Glaser's Annalen.*

New and Old Naming of Streets in Mexico.

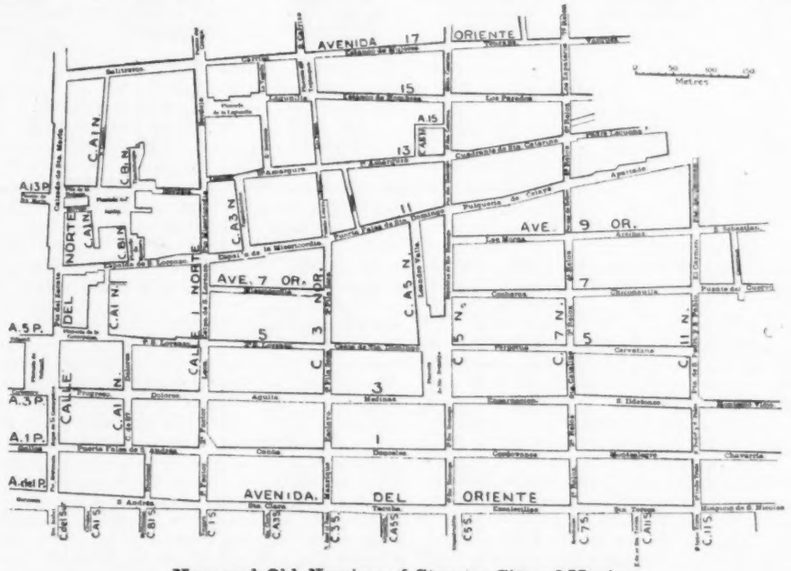
The present system of street nomenclature in the city of Mexico, for the new one is as yet only "ordained", is probably the most fantastically absurd which exists in the world, amounting in fact to no names at all so far as the general public are concerned, and still more a stranger, since no one but a professional hackman who has spent his life in the city can pretend to find his way about it by the names of the street.

How this system originated we do not know, probably from custom in some small Spanish towns, since there, is nothing like it in Madrid nor other large Spanish cities. The system, however, in all its beauties is illustrated in our cut, which is, to give a separate name to each *block*, so that in walking half a mile along a single street we may be walking through a 8 or 10 successive so-called streets of wholly different names. Thus the new *Avenida del Oriente*, which is the dividing east and west street through the center of the city has 7 different names given on our map, and this is less than a quarter of its total length. What makes the system still more confusing is that the same name or nearly the same name, with or without the often omitted distinction of *primera*, *segunda* etc., is often given to widely separated streets.

The consequence is that the only way for the stranger or even the resident to find his way around Mexico is either to trust to luck or take a cab. There is an excellent cab system, which puts New York to shame, at uniform rates of 25 and 50 cts. per half hour, according to the finish of the carriage, as indicated by a colored tin flag displayed only when the cab is not engaged; and as cabs are abundant, this system goes far to minimize the evil to a stranger, but nevertheless the system involves many inconveniences, and is a subject of laughter and reproach. To remedy it the new system illustrated has at last been established, by an order promulgated Oct. 26. It is in substance as follows:

The city is divided into four nearly equal parts by two streets running entirely across it at right angles to each other. Their intersection is the "origen" of the numbering of both streets and avenues.

All streets running north and south are called *Calles* (pronounced cah-yase) or streets; all streets running east and west are called *Avenidas* or avenues. The dividing north and south street, north of the origen, is called *Calle del Norte*, or North St. and south, *Calle del Sur*, or South St. All streets parallel to it and *East* of it are called in succession *Calle* 1 *Norte*, *Calle* 3 *Norte*, *Calle* 5 *Norte*, etc., using only the odd numbers; the same streets south of the dividing avenues are called *Calle* 1, 3, 5, *etc. Sur*. West of the dividing street, the parallel streets are numbered *Calle* 2, 4, 6, *etc. Norte* and *Sur*, so that merely the name of the street indicates not only whether it is north or south of the center, but also whether it is in the N. E., S. E., N. W. or S. W. quarter.



New and Old Naming of Streets; City of Mexico.

[Names in CAPITALS are the new names; those in lower-case letters the old names]

Similarly, the dividing avenue is itself divided into *Avenida del Oriente*, or East Ave. and *Avenida del Poniente*, or West Ave. The parallel avenues are numbered on the north *Ave.* 1, 3, 5, 7, *Oriente* (E.) and *Poniente* (W.), and on the south, *Ave.* 2, 4, 6, 8, etc.

The dividing avenue, to those familiar with the city, is the broad and handsome street which runs back of or north of the Cathedral, and north of the Alemeda. The Mexican Central Railway station fronts on it. The dividing street is the first one east of the Alemeda, toward the Cathedral. The Government Palace and the main business section is accordingly in the south-east quarter of the city, and Chapultepec and the grand avenue running to it in the south-west.

So much for the main outlines of the plan, but as Mexico is not by any means an entirely regular city, although it is so in the main, it requires some modifications. One of these is to give streets which only extend over a few blocks their regular number, which requires in other parts of the city an apparent jump of one street, as between *Calle* 7 *Norte* and *Calle* 11 in our map. Another, used when there are only short blocks to be named is to introduce the designations *A* 1, *B* 1, *A* 3, *A* 5, etc., for such short streets, as at the bottom and left side of the map. By these two devices the system is very successfully extended over the entire city.

The numbering of houses is likewise conformed to this system. On the north and east the numbers run 501, 503, 505, etc., for one block; then 701, 703, etc., then 901, 903, and so on, conforming to the numbers of the crossing streets.

This system is already familiar, but the jump from 501 to 701 and 901 is something of a novelty. It seems, however, quite unobjectionable. Only 5 metres (16 ft.) is allowed to a number. If houses are wider, a number is dropped occasionally, to prevent any necessity for ever using half numbers.

Cable Railways of Kansas City.

The following table shows the present condition of the several cable railway systems of Kansas City, Mo. KNIGHT & BONTECOU are the engineers of the Metropolitan, Grand Ave., and Holmes St. lines; ROBERT GILLHAM is engineer of the Interstate Rapid Transit and People's lines, and also of the main and 10th St. lines of the Kansas City company; CLIFT WISE is engineer of the E. 9th St. and Troost Ave. lines of the Kansas City company, and T. F. WYNNE is engineer of the Union line.

Companies.	Lines.	Miles of d'ble track	Date of Opening.
Kans'a City Ca'le Ry.Co	Main line.	2.74	June, 1885
" " "	E. 9th St.	0.55	July, 1886
" " "	Troost Ave.	2.66	Nov., 1887
" " "	Washington St.	1.75	In progr'ss
Metropolitan St. Ry.Co.	5th St.	1.66	May, 1887
" " "	Wyandott ext.	2.21	.....
" " "	12th St.	4.02	April, 1888
" " "	18th St.	3.38	In progr'ss
Grand Ave. Ry. Co.	15th St.	1.32	Dec., 1887
" " "	Walnut St.	2.72	.....
" " "	Westport.	2.84	.....
Int'rst'te R'pid Tr'n'it	8th St.	0.70	May, 1888
" " "	Riverview.	1.90	May, 1888
People's Cable Ry. Co.	10th St.	3.50	Aug., 1888
Union Cable Ry. Co.	4th St.	4.00	In progr'ss
Holmes Street. Ry. Co.	Holmes St.	2.00	In progr'ss
Total		37.95	

A Constant Water Supply for London, England.

Having been requisitioned by the vestries to insist on a constant water supply, the Corporation of London have inquired into the matter, through their Gas and Water Committee. The New River Co. informed them that they were perfectly willing to give a constant supply if called upon to do so, provided the regulations prescribed by the Metropolis Water Act, 1871, were previously complied with. By those regulations every owner or occupier of premises within the district must within two months after service of notice from the company provide his premises with the requisite fittings to receive a constant supply, and keep them in proper repair. The company would not be compelled to give a constant supply to any district if it could be shown that within two months from the time of the service of any requisition for constant supply more than one-fifth of the premises were not provided with the prescribed fittings, or if they were out of repair, in which case the owner or owners might be fined £25, and the company might either withdraw the supply, or provide or repair the fittings at the cost of the owner or occupier. The average cost of providing the requisite fittings, judging from the experiment in St. Pancras, would be over £25 in each case, and if a new lead pipe from the main to the house was required, the expense would be very considerable, and the occupier of the property would not only have to pay for this, but also the cost of pulling up the pavement. In the case of a constant supply, all existing fire-plugs would have to be removed and the number of hydrants doubled. A danger also existed of pipes charged with the high pressure of a constant supply bursting, and the water flooding the cellars of warehouses. Under the intermittent system the sewers had always been better flushed. Upon the whole the committee are of opinion that for these and other reasons it is not expedient, in the interests of the petitioners and the citizens generally, to take any steps in the direction indicated.—London *Financial News.*

AN EAST BOSTON BRIDGE project is before the Boston Aldermen, in the shape of an order passed directing the City Engineer to prepare plans and estimates for a structure to connect East Boston with the city proper.

English and American Railways Compared in Operating Expenses.*

For the information of a very prominent official and large share-holder in English railways, the author made some of the following comparisons. The result was so astonishing that he decided to enlarge upon it, and make a short paper, in hope of getting the subject freely discussed. The English and American practice differ so widely that both cannot be right; engineers and railway officials should discuss it freely, and adopt the principle that is the best and most economical, regardless of its nationality. When the author commenced this investigation over five years ago, it was with the intention of showing the American engineers that it was the best policy to build good roads at first, as the English do, and save in the cost of operating expenses. He then thought that it would be possible on roads with large traffic, to save more than the additional interest charge, but as the investigation progressed, he was greatly astonished to find that the Americans were operating their roads much cheaper than the English, though built probably at less than one-fifth of the average cost of English railways. This so surprised him that he thought there must be some mistake in his data and investigations, and acting upon this belief, he postponed the reading of the first paper for six months, until he could again visit England and re-examine the subject and data.

It is now more than three years since his first paper, entitled "English and American Railways Compared," was read before the Society, and since then the subject has been much discussed by the press and railway officials; but about the only thing that has been said against it is, that it was based upon assumed data; in reality all the important figures given in it were from official sources, except the tonnage and passenger mileage; unfortunately the English roads do not give these. In reference to this, the author stated in his first paper, (p. 16) "No return of these all important items for comparison is made in England. The author, after careful inquiry and investigation, decided that the average freight charge on all freight moved in the United Kingdom was about 1¼ pence, or 2.5 cts., per ton per mile; but in order to be conservative he has taken the average charge at 1 penny, or 2 cts., per ton per mile." In order to get the ton mileage, the receipts from freight, as reported by the companies, in pounds sterling, have been multiplied by 240.

In the supplementary paper a year later, and after more thorough investigation had been made, the author said: (p. 110): "He hopes that the English railways which are so largely interested in this question will promptly replace his estimate of ton and passenger mileage by their official figures. Until this is done he claims that these figures should be accepted as correct."

Since this was written it has been investigated for two years more, fully confirming the preceding opinion and data.

All the data and figures in this paper are taken, for the English roads, from the "Board of Trade Railway Returns," or "General Report," and for the American roads from "Poor's Manual," or the annual reports of the companies.

In traffic expenses the Pennsylvania Railroad includes "rates and taxes," and "compensation for personal injury" and "compensation for damage and loss of goods," amounting to $322,370 for 1887, which should be deducted to make it correspond to the English roads, as on them they are not included in traffic expenses.

In the accompanying table the five principal English railways have been selected. Among the American railways the Pennsylvania Railroad Division has been selected as representing the best constructed American road, and the Knoxville Branch

ENGLISH AND AMERICAN RAILROADS COMPARED IN OPERATING EXPENSES.

1887. £1 = $4.80. 1d. = 2 cents. All figures representing cost are in cents, except the average cost per mile of railway operated, which is in dollars.	Pennsylvania Railroad Div.	Knoxville Branch, Louisville and Nashville System.	London and North-western.	Percentage against L. & N. W. and in favor: Penn. Div.	Percentage against L. & N. W. and in favor: Knoxville Branch.	Great Northern.	Percentage ag'inst Great North'rn and in favor: Penn. Div.	Percentage ag'inst Great North'rn and in favor: Knoxville Branch.	Midland.	Percentage against Midland and in favor: Penn. Div.	Percentage against Midland and in favor: Knoxville Branch.	Great Western.	Percentage ag'inst Great Western and in favor: Penn. Div.	Percentage ag'inst Great Western and in favor: Knoxville Branch.	Great Eastern.	Percentage ag'inst Great Eastern and in favor: Penn. Div.	Percentage ag'inst Great Eastern and in favor: Knoxville Branch.	United Kingdom.	Percentage against all railways of United Kingd'm and in favor: Penn. Div.	Percentage against all railways of United Kingd'm and in favor: Knoxville Branch.
Average cost per mile of railway operated, in dollars	.....	$39,190	$255,888	.....	.....	$195,500	.....	.....	$255,727	.....	.....	$161,030	.....	.....	$212,895	.....	.....	$207,408	.....	.....
1. Percentage of total tonnage mileage transported East	74	30	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
2. Percentage of total tonnage mileage transported West	26	70	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
3. Average tons in loads of freight trains	207	154	79	162	96	60	245	157	61	240	152	64	223	140	62	234	149	70	196	120
4. Average charge for transporting one ton one mile, cents	.67	90	2.00	200	120	2.00	200	120	2.00	240	120	2.00	200	120	2.00	200	120	2.00	200	120
5. Percentage of operating expenses to earnings	63	58	52	.....	.....	56	.....	.....	52	.....	.....	49	.....	.....	53	.....	.....	52	.....	.....
6. Percentage of operating expenses to earnings on the Pennsylvania Railroad Division, provided it charged the same rates for fr'ight as are charged on the English railways, viz., 1d = 2 cents per ton per mile	.....	.....	21	148	.....	21	148	.....	21	148	.....	21	148	.....	21	148	.....	.....	148	.....
7. Percentage of increased earnings that the Pennsylvania Railroad Division would receive if it worked with their pres'nt oper'ting expense and receiv'd the same fr'ight rates (1d. per ton per mile), as the English railways now receive	.....	.....	545	.....	.....	545	.....	.....	545	.....	.....	545	.....	.....	545	.....	.....	545	.....	.....
8. Percentage of traffic expenses (coaching and merchandise) to total operating expenses	35	32	36	.....	.....	34	.....	.....	34	.....	.....	31	.....	.....	31	.....	.....	31	.....	.....
9. Average cost of transporting 1 ton 1 mile. The cost for the English railways is found by multiplying the estimated charge of 1d. per ton per mile by the percentage of operating exp'nses to the gross earnings, as per paragraph 5 above; cents	.426	.504	1.04	144	106	1.12	163	122	1.04	144	106	.98	130	94	1.16	149	110	1.04	144	106
10. Average cost of transporting 1 ton 1 mile, deducting on the English railways all "Traffic Expenses (coaching and merchandise)," and ded'cting n'thing from the total operating expenses of the American railroads; cents	.426	.504	.666	56	32	.739	74	47	.686	60	96	.676	59	34	.731	72	45	.718	69	43
11. Average cost of transporting 1 ton 1 mile, deducting all "Traffic Expenses" (coaching and merchandise) on all roads; cts.	.277	.343	.666	140	94	.739	167	116	.686	148	100	.676	144	97	.731	164	113	.718	160	109
12. Average cost of train mile—freight and passenger; cents	85.37	71.00	65.88	.....	.....	55.42	.....	.....	53.40	.....	.....	58.10	.....	.....	56.04	.....	.....	60.52	.....	.....
13. Equated cost of train mile on the English railways, provided they transported their present train loads at the same cost per ton per mile as is done by the American railroads, to which they are c'mp red, in cts	.....	.....	Cost...	33.65	39.82	Cost...	25.56	30.24	Cost...	25.99	30.74	Cost...	27.26	32.26	Cost...	26.91	31.25	Cost...	29.82	35.28
			Per ct.	96	65	Per ct.	117	83	Per ct.	113	80	Per ct.	113	80	Per ct.	112	79	Per ct.	100	72

* A Paper by EDWARD BATES DORSEY, M. Am. Soc. C. E., read before the American Society of Civil Engineers, Dec. 5, 1888.

of the Louisville & Nashville system as a sample of the cheaply constructed class, both running through a comparatively rough country. Both of these roads have most of their traffic in one direction. This reason is very frequently given by English officials for the high freight rates on their railways. At first the author included in the Pennsylvania system, the Philadelphia & Erie, and the United Railroads of New Jersey divisions, but on reflection he thought best to exclude them, as it might be said that the level or easy grades on these roads were particularly favorable to cheap transportation. The Pennsylvania Railroad Division was retained, as it traverses a broken country with many heavy grades and has one summit of 2,154 ft. above tide.

In absence of official data as to the average charges for transporting one ton of freight one mile on the English railways, the author has assumed that the

average charge is one penny, or 2 cts. per ton per mile (£1 = $4.80), being the same figures as given in his book and paper on pages 16 and 109, which figures have not been contradicted in any way, but have been repeatedly confirmed.

These comparisons speak very strongly in favor of the American system. The high terminal charges (including receiving and delivering freight by carts), is generally given as an excuse for the very high freight charges in England; paragraph 14 and 15 show that there must be other reasons than these. In absence of any data as to what this expense amounts to, the author has in paragraph 14 deducted from the operating expenses of the English railways everything included under the name of "Traffic Expenses" (coaching and merchandise); this must certainly include all terminal charges and cartings. On the American railways no deductions of any kind from the total operating expenses have been made; notwithstanding this, there is still a very large percentage in favor of the American roads, on the Pennsylvania it being 56 per cent. in its favor, compared with the London & Northwestern.*

In paragraph 11 all traffic expenses (coaching and merchandise) have been deducted from the operating expenses of all roads; this shows a very large percentage in favor of American railways.

Paragraph 6 shows the error in the statement usually made that the English railways are operated more economically than the American on account of the operating expenses of the English roads being about 52 per cent. of the earnings, while the American roads are about 10 per cent. higher. If the earnings on both roads were derived from the same charge for moving freight, the operating expenses of the Pennsylvania road would be only 21 per cent. of the earnings against 52 on the London & Northwestern, or 148 per cent. in favor of the American road.

It is frequently stated that the English railways are operated more cheaply than the American, because the train mile on the former costs somewhat less than it does on the latter, which is entirely wrong, if proper allowance is made for the difference in the average number of tons in the train load, which average, as per paragraph 3, is 79 tons, on the London & North Western, against 207 on the Pennsylvania. Paragraph 13 shows that if proper equation is made for the heavier load, the cost per train mile will stand on the London & North Western $.6588, against $.3365 for equal load on the Pennsylvania, or 96 per cent. in favor of the latter.

There must be some cause for this great difference in the operating expenses of these roads; in the author's opinion the following are the principal reasons;

First.—Too light loads to the English trains, both freight and passenger.

Second.—The universal use on American roads of rolling stock with bogie-trucks, which moves with much less friction and wear and tear than the rigid wheel base rolling stock mainly used by the English railways.

Third.—The use on the American roads of freight cars carrying a much greater percentage of paying load to dead weight than the wagons used on the English railways.

Fourth.—The great speed at which the English freight trains run.

Fifth.—The use on the English roads of light locomotives with inside connections that cannot be as cheaply or as easily repaired as the American locomotive, with its outside connections.

Sixth.—The custom on the English railways of giving each individual shipper the exclusive use of a freight wagon, even for very small quantities of goods.

The Pennsylvania Railroad Division is one of the few American railways that approximate in thoroughness of construction to the average English roads. Even on this line there are many cheap station buildings, platforms, etc., that require constant repairs and renewals. Consequently, their maintenance is more expensive than the permanent masonry structures on the English roads. This applies still more forcibly to the American roads of inferior construction.

Of the 150,000 miles of railways in the United States, it is safe to say that there is not 5 per cent. of them ballasted up to English average standard, and perhaps more than one-half of the remainder without any pretence whatever to ballast.

The large English railways are very similar to each other in the great details of their operations, as shown by the table. From all the data that is available, it appears that the cost of transporting 1 mile, 1 ton or 1 passenger, is about the same on the principal English railways. The question has been frequently asked, "How can the English railways pay the interest on their great cost, unless they continue to charge their present high freight rates?" This is entirely foreign to the object of this paper, which proposes only to discuss the cost of operating expenses in the two countries. The author is, however, thoroughly convinced, that on the English railways large reductions could be made in the present freight rates and cost of operating expenses, without diminishing the present dividends in the least.

On the English railways there is a great variety of rolling stock, differing very widely; this is especially true regarding the locomotive. It is not possible that these different varieties, differing so very much, can all be equally good. It is strange that the best type has not been selected, and generally adopted especially on the same road. During a recent visit to Stoke-on-Trent, the author was told by the Duke of Sutherland, in reply to the question why he did not work his coal and iron mines more extensively, as the situation was very favorable for producing cheap coal and iron, that the railway freight charges were nearly prohibitory, being to Liverpool —55 miles—7 shillings = $1.75 per ton, or 3.2 cts. per ton per mile; compare this with the charge on the Louisville & Nashville Railroad of $1.40 per ton from Birmingham to Mobile, 280 miles, or ½ ct. per ton per mile, or one-sixth of the English charge, and this over a road much inferior in construction. A prominent railway official gave the usual reason for this high freight rate, that it was owing to the high terminal charges at Liverpool. There was none at Stoke, the iron being loaded into the cars by the furnace company. No data is given by which these terminal charges can be ascertained, but to be certain that we get all of them, let us deduct from the operating expenses all the "Traffic Expenses" (including coaching and merchandise), 36 per cent., as in paragraphs 8 and 10 of the table, this will leave $1.12 as the freight charge, or over 2 cts. per ton per mile, after deducting all traffic expenses. Compare this with the rate on the Louisville & Nashville Railroad of ½ ct. per ton per mile, and without any deduction whatever from the total operating expenses.

The preceding percentages of the American railways would be very largely increased, if proper allowances were made for the higher wages paid, their difference in first cost—fully 1 to 5, and consequently inferior construction, and their perishable wooden buildings and bridges.

It is now five years since the author commenced this investigation. All the data collected in this time proves that on the American railroads the total cost of transporting one ton per mile is less than half of what it is on the English roads. The author concludes his paper with the concluding sentence of his first paper: "For what is done in the United States ought to be done in the United Kingdom."

*Being 144 per cent. in favor of the Pennsylvania Railroad when compared to th London & North Western.

MECHANICAL TRACTION is proposed for the street railway lines of the Liverpool United Tramway & Omnibus Co., of Liverpool, England, which company is advertising for proposals for the mechanical haulage of its cars at a rate per mile. Any system that may be adopted would be subjected to the approval of the Liverpool corporation and the lessors of other lines.

THE RAILROAD IN PERSIA has been already voted an enemy to the human race because an awkward and unlucky native fell under the wheels as the result of jumping off a train in motion. The mob tore the cars to pieces and the train hands only saved themselves from a like fate by taking to their heels. It is the old story of a first acquaintance with the puffing monster, which is popularly supposed to hide a lusty devil somewhere in its "innards" who makes the wheels go round.

Fluctuations of Temperature in Different Years.

From an interesting table giving the mean monthly and yearly temperatures in Philadelphia for a period of 64 years, from 1825 to date, which appears in the *Monthly Weather Review* of the signal service, we extract a few details which will be of interest. The mean temperature of each month for the entire period has been

Jan.	31.6°	May	63.6°	Sept.	66.7°
Feb.	33.2°	June	71.9°	Oct.	55.5°
March	40.4°	July	76.8°	Nov	44.4°
April	51.6°	Aug.	74.4°	Dec.	34.7°

Mean of annual means, 53.8°

The fluctuations in mean annual temperature are comparatively small, as follows. In preparing the total all the means of 49° +, 50° +, etc., as from 53.0° to 53.9°, have been grouped together.

	No. Years		No. Years
49.0° to 49.9°	1	53.0° to 53.9°	22
50.0 " 50.9	1	54.0 " 54.9	19
51.0 " 51.9	3	55.0 " 55.9	5
52.0 " 52.9	10	56.0 " 56.9	2
		Total (mean 53.7°)	63

The extreme variation in annual mean will be seen to be only 6° to 7°, and excluding 5 years out of 64 only 3° to 4°. The months naturally fluctuate much more as shown by the following, the least fluctuations being in the summer months.

MEAN MONTHLY TEMPERATURE OF

January		April		July		October	
Mean temp.	No. years	Mean temp.	No. years	Mean temp.	No. years	Mean temp.	No. y'rs
22½°	1	44 1-2°	1	72 1-2°	1	48 1-2°	1
23½	0	45 1-2	1	73 1-2	4	49 1-2	2
24½	2	46 1-2	2	74 1-2	7	50 1-2	2
25½	2	47 1-2	2	75 1-2	12	51 1-2	0
26½	4	48 1-2	6	76 1-2	12	52 1-2	4
27½	5	49 1-2	7	77 1-2	8	53 1-2	5
28½	5	50 1-2	7	78 1-2	7	54 1-2	12
29½	6	51 1-2	9	79 1-2	7	55 1-2	11
30½	5	52 1-2	5	80 1-2	5	56 1-2	8
31½	3	53 1-2	8	81 1-2	0	57 1-2	5
32½	4	54 1-2	8	82 1-2	1	58 1-2	7
33½	7	55 1-2	3			59 1-2	2
34½	3	56 1-2	4	Total	64	60 1-2	4
35½	3	57 1-2	0	Mean	76.8°	61 1-2	0
36½	4	58 1-2	1			62 1-2	1
37½	4						
38½	3	Total	64			Total	64
39½	2	Mean	51.6°			Mean	55.5°
40½	0						
41½	1						
Total	64						
Mean	34.6°						

It will be seen that the range in monthly averages is a very wide one, ranging from 11° to 20°, which means a very great difference in effect upon the senses. Even in the annual means, a *constant* difference extending through every day in the year of 5° in temperature would probably be noticed by every one, although on single days 5° more or less attracts little attention.

Railways in China.

So much has been said and so many rumors have been circulated in this country during the past few years with regard to projected railways in China, that the following information, contained in a report by THOS. F. PETTUS, U. S. Consul at Ningpo, and dated March 30, 1888, will undoubtedly be of interest.

There is no railway in this (Chekiang) province, nor is there any prospect of any in the near future. Last May a proclamation was issued by H. E. LI HUNG CHANG, viceroy of the province of Pechihli, asking subscriptions for the completion of the railway from K'aiping to Tientsin. This proclamation caused a good deal of discussion among the Chinese here as to the building of railways and investing money in them. So far as I can find out there was no one here who took stock. Their opinion seemed adverse to building railways, and they argue that the building of them would throw many laborers out of employment, and also interfere with their shipping. Perhaps one of the greatest obstacles in the way of railway building here would be the removal of the dead graves that would be in the way of the survey for a road.

PROCLAMATION ISSUED BY LI-HUNG-CHANG, VICEROY OF PECHIHLI, CALLING UPON THE PEOPLE OF THE CHEKIANG PROVINCE TO BUY SHARES IN THE RAILWAY TO BE CONSTRUCTED BETWEEN TIENTSIN AND K'AIPING.

"The extension of the existing railway at K'aiping to Tientsin will be of advantage to the Government and convenient to the people. The railway company will not be connected with the mining company at K'aiping. The rules compiled by the managers and shareholders have been sent me by the directors, WU YA'OTAI and others. The company will be carried on in a strictly commercial manner,

and the officials connected with it will only protect its rights and see the concern directed honestly.

"A capital of 1,000,000 taels (about $1,500,000) is to be raised; printed prospectuses for shareholders have been distributed, and in case they do not meet with faith in distant places I have issued this proclamation. It must be understood that railways are in use in foreign countries. Our people who have traveled have seen with their own eyes the advantages, and wherever are railways the trade will flourish. All rich people in all foreign countries invest their money in railway stock as an inheritance for their children. China, in following the example of foreign countries in all her matters, should be saving and deal honestly with the shareholders. When a profit is realized by the railway company it will be divided justly among the stockholders, and the managers are not to profit thereby. This is important to the Government, and the officials must see that it will be lasting and worked honestly. All the work must be carried on as in a foreign country, and the business sealed by the shareholders and managers; although officials are connected with it, they have no power to transact business, and are only to see that it is carried on honestly. Anyone in the Chekiang Province desiring shares will apply early. Do not lose this opportunity. Dated the 13th year of Kuang Hsü, 4th moon, 24th day, May 16, 1887."

A later report stated that the China Railway Co. which was organized to build a road from the Hai Ping mines to the Peiho river and Tien Tsin, had its road completed and in operation between the mines and Fangku, or the Peiho river, by May 21, and expected to have it in operation to Tien Tsin by July or August. Recent press dispatches have reported the opening of this line. The line is said to have cost little, and to be worked economically. Apparently the Chinese cannot succeed in preventing the entrance of the wedge to make a way for a future railway system.

An Old Stone Bridge.

In our comparatively new country any structure antedating the Revolution is "old", consequently the stone arch "Choate Bridge" spanning the Ipswich river, at Agawam, must come under this category, as it was built in 1764 and is one of the oldest, if not the very oldest stone arch bridge in the country.

From an article in the Boston *Transcript* we learn that the builder was Judge CHOATE, a member of the Colonial Government of Massachusetts for many years and the commander of the 8th Massachusetts Regiment at the seige of Louisburg in 1745. In 1760 he was treasurer of Essex Co., and as such he superintended the outlay of the money appropriated by the county for this bridge. He advocated stone as the material, and planned the bridge against the wise sayings and head-shaking of his doubting contemporaries. The arches are low and the spans are about 35 ft. each; but the Judge did not propose that his bridge should fall, and consequently the amount of stone used was enormous for the work to be done. He took the granite as it came from the ledge, unmarked by any tool; but the stone for the arch was carefully selected and the work stands intact to-day as a monument to his ideas of a permanent structure.

The mantle of Judge CHOATE, as a bridge-builder, has fallen upon Mr. I. H. BURNHAM, a descendant and now a representative of the King Iron Bridge Co., of Cleveland, O. He naturally takes a pride in this work of his ancestor and is anxious to know if an older stone bridge exists in the United States. Stone arched structures of older date are abundant in Mexico, and the origin of the Newport "Mill", supported on arches, is lost in the mists of our very earliest history; but we do not now recall any arch bridge of older date as still standing in the States.

If we are wrong we trust some of our readers will make the correction, with full details.

ANOTHER THAMES TUNNEL is to be built at London England, and the Metropolitan Board of Works is advertising for proposals for the construction of a footway tunnel of cast-iron, lined with brickwork, across and under the river Thames at Blackwall, with approaches thereto, on both sides of the river, partly in tunnel and partly in cut and cover and open cutting, together with temporary landing stages and other works in connection therewith. The tunneled portion of the work is to be executed under compressed air. Bids will be opened Dec. 20,

THE SLEEPING-CAR PORTER is attracting the attention of the Kansas Legislature in the shape of a bill to be introduced which fixes his minimum pay at $2.50 per day and makes it a misdemeanor for him to receive "tips" for extra service. The lowering of this important official to the level of an ordinary conductor or other employee will be a sad blow to the "funny men" of our daily press.

The North & South American Construction Company in Chili.

The roads which are to be constructed by the North & South American Construction Co. are briefly analyzed as follows, beginning at the most northerly one, by Col. S. H. LOCKETT, who was one of the representatives of the syndicate in securing the concession.

1. Road from Huasco to Vallmar, 1 metre gauge, 50 kilometres long; starts at the Port of Huasco, a village of about 1,000 inhabitants, lying on a bluff near the mouth of a small river, whose waters coming from the melting snows of the Andes sometimes find their way to the sea, but are generally exhausted in irrigation or lose themselves in the sandy river-bed. Huasco has quite an extensive copper smelting works. The harbor or roadstead is fairly good, but a mole is needed, and is one item of the specification for the railway. The road runs up a level cultivated valley with but very slight irregularity of surface, crosses the river once on an unimportant bridge, terminates at Vallmar, a town of between 5,000 and 6,000 inhabitants; climate good; valley fertile and fruitful.

2. Road from Ovalle to San Marcos, is 1 metre gauge, 60 kilometres long; is prolongation of a road now in operation from Coquimbo to Ovalle, a town of 5,500 souls. The roads follow the valley of the Limaré river, cutting across the spurs of hills, giving rise to some deep, but not long, excavations and fills; considerable amount of rock cutting, but nothing that would be called difficult work; one important bridge across the Limaré river of 210 metres length; numerous small bridges, culverts and drains across the irrigation canals, and small runs from the side hills; climate good; valley fertile. Coquimbo, the landing place, is considered the best port of the entire coast.

3. Road from Los Vilas to Illapel and Salamanca: starts from the port of Los Vilas, where there is a mole, takes a sharp curve around a lake back of the port and returns to the coast, skirts along the coast, crossing sand dunes, and mouths of gulches, coming around or cutting through rocky headlands till it arrives at Huantelauquen, a distance of 5.19 kilometres. This is a somewhat difficult portion of the line to construct, and will be more difficult to keep in good condition.

At Huantelauquen the road turns up the narrow valley of the Choapa river, one branch following this river to Salamanca, the other to Illapel on a stream of the same name. Both streams have rocky spurs to be skirted or cut through. There will be gradients of 2 per cent. and numerous curves, so that the entire line may be designated as "heavy work." The valleys are fertile, and the mountains rich in silver, copper and gold, climate good. There will be two bridges of 60 metres span, one of 40, and numerous smaller ones. Road from La Calera, to La Ligua and Cabildo 77 kilometres, 1 metre gauge, starts from La Calera on the Valparaiso and Santiago line, crosses the Aconcagua river on a bridge of 200 metres length, and follows the valley of the Melon 16 kilometres; winds up the "quebrada" (cañon) of Collague until at the 25th kilometre it is 495 metres above the level of the sea; here crosses the Sierra del Melon by a tunnel nearly a thousand metres long; winds down the northern slope of the sierra and reaches the valley of La Ligua at an altitude of 69 metres above sea level, then follows the valley on an easy line to its terminus at Cabildo. The gradients in crossing the "divide" are as high as 3 per cent.; curves are numerous; 123 culverts and small bridges, one bridge 200 metres long, and three others of minor importance. Being in the heart of Chili, the line has favorable conditions for securing labor, plant, etc. The *heaviest* work of all the lines is on this one.

5. Road from Santiago to Melipilla, 59 kilometres long, 1.68 metres gauge, follows the rich fertile valley of the Mapocho river, presents no difficulties, has one bridge of 252 metres in length.

6. Road from Palmilla to Alcones; 45 metres long 1.68 metre gauge; is a prolongation of a branch of the main trunk line south, runs through a level and undulating country; presents no points of difficulty or of special interest. It is proposed to continue this ultimately to the coast having Pichilemo for its terminus; this extension will cross the coast range and bring in some tunneling and other varieties of mountain work.

MAP OF CHILI, SHOWING RAILWAYS CONSTRUCTED, SURVEYED AND PROJECTED.

7. Road from Talca to Constitucion, 85 kilometres long, 1 metre gauge; starts from the important inland city of Talca, follows the river Maule on its north bank until it has reached a point nearly opposite to Constitucion, at its mouth; crosses the river by a bridge 280 metres long, which is much the most difficult work of the line. Following the sinuosities of a crooked stream, sharp curves are numerous, and deep, short cuts and corresponding fills of frequent occurrence, with considerable rock work. One tunnel 90 metres long is encountered.

8. Road from Pelequen to Peumo,28 metres long, 1.68 metres gauge; is a branch of the main trunk line running through a level country, having nothing of interest except a bridge across the Cachapoal river of 360 metres length.

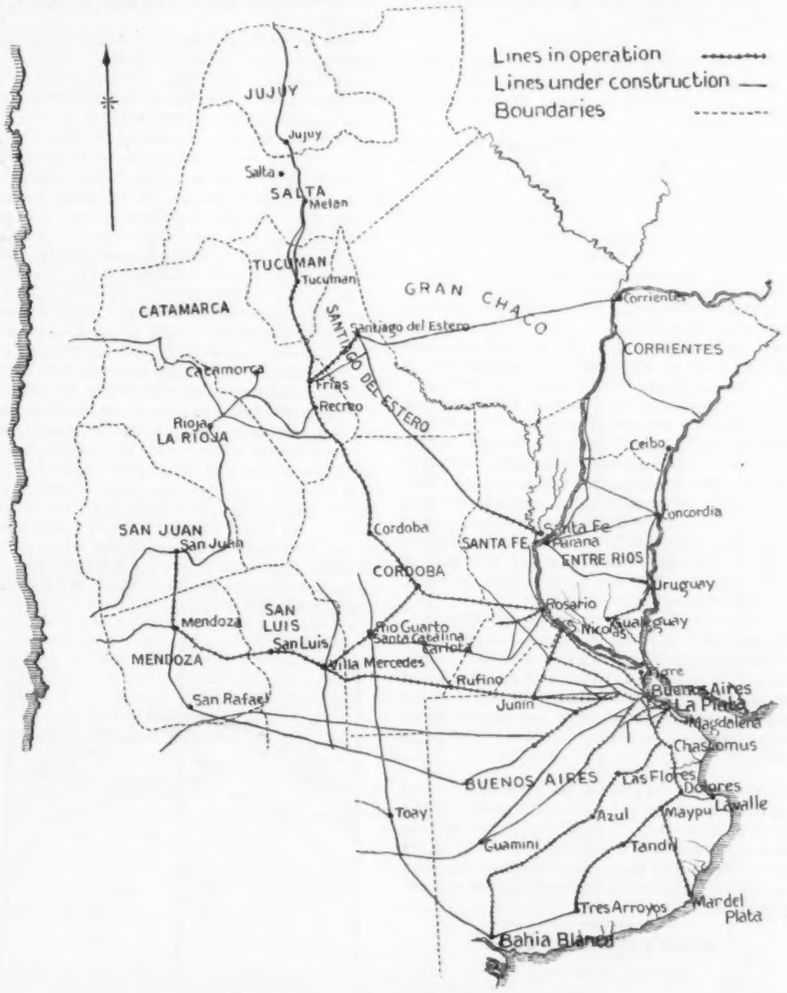
9. Road from Coihue to Mulchen, 43 kilometres long, 1.68 metre gauge; a branch of the main trunk line running up the valley of a small stream with no elements of difficulty.

10. The road from Victoria to Valdivia and Osorno 403 kilometres long, 1.68 metres gauge.

This is the prolongation of the grand central trunk line, follows the trend of the central valley, generally avoids hills and rough ground, but crosses numerous small streams and many of considerable size. About 20 miles from Victoria it enters the southern forest, a region comparable to the great forests of Oregon. Considering the length of the line, the grading work will not be very heavy; but one short tunnel occurs, but the amount of bridging is proportionately very great. In addition to numerous small bridges, culverts, open and arched drains, there are 41 principal bridges varying between 50 and 250 metres in length, and ranging in height from 4 metres to 38 metres. The climatic conditions will present some difficulties, as the rains are copious and the rainy season prolonged.

The labor question will be one of considerable importance in the execution of works of such magnitude in a country whose population is only 2½ millions of people. But the liberality of the government in providing for the introduction of foreign laborers and artisans has done much towards a solution of this problem. It might be mentioned here that a prevalent soil in Chili is the so-called *tosca*, or "hard pan" of the United States.

Taking all things into consideration, there seems to be every reason for believing that the contract just made between the Chilian Government and the N. & S. A. Construction Co. will be fulfilled in the specified time of five years, to the honor and credit and profit of both parties.



Railway Map of the Argentine Republic.

Showing lines constructed and under construction (the last including all lines for which concessions have been granted; some of them not likely to be built soon).

SCALE:—Nearly 200 miles to the inch. The air-line distance from Buenos Ayres to the Pacific coast is about 760 miles.

In connection with this map of Chili we give also the accompanying map of its neighbor, the Argentine Republic,showing vividly the great activity in railway construction in that country. We regret that we have no figures of the amount actually under construction at the present time as distinguished from those which have merely been "conceded", usually with a Government guarantee. The map from which our own is reproduced, a very recent one, regards all these lines as "under construction", which is hardly the case, although a large part of the mileage shown is likely to be constructed. From any point of view the showing is a striking, one considering that from 1878 to 1884—we have no later figures at hand for all the countries—the mileage of Buenos Ayres nearly doubled, while that of Chili increased 35 per cent. and the United States only 53 per cent. It is not generally known that, vast as has been the progress of the United States in railway construction, that of the American hemisphere as a whole has been even greater. The figures are, assuming 1 kilo. = 0.621 miles.

	Miles 1878	Railway 1884	Increase p.c.
United States	81,717	125,379	53.4
Canada	5,911	9,572	61.8
Brazil			122.0
Chili	1,439	2,842	97.5
Argentine Republic	1,049	1,413	34.7
Other countries	3,127	6,506	108.0
Total N. and S. America	94,961	149,509	57.4
(With these totals may be contrasted)			
Europe	99,046	117,868	19.0
Asia	8,847	12,897	45.7
Africa	2,450	4,179	70.4
Australia	3,973	7,541	89.7
Total, Eastern Hemisphere	114,316	142,485	24.6

Truly, "Westward the star of empire takes its way". In these contrasted tables is a lesson beyond denial as to the value of free institutions; for in no other way can the superior vigor of all the American continent, including many diverse races and climates be rationally explained. If these statistics extended down to the present date,they would show a still more striking contrast, for the rate of progress since 1884 in nearly all the American countries has been in an accelerated ratio, especially in the South American countries which we have been especially considering in this article.

Patagonia, we may add, is being rapidly reclaimed to civilization and proving to contain much valuable land. One of the possibilities of the future, as a result of the extension of railway communication, is that Chili and the Argentine Republic may yet become consolidated under one Government, and lead to the formation of a "United States of South America" whose growth may be as phenomenal as that of its northern prototype.

THE LUBRICATION OF AIR-COMPRESSING MACHINERY—Mr. JOHN MORISON read a paper at the last meeting of the North of England Inst. of Mining and Mechanical Engineers on "The danger attending the use of light mineral oils for lubricating air compressing machinery." On Feb. 13, 1888, Mr. MORISON examined at Newbattle Colliery, Dalkeith, the discharge pipes leading from an air compressor to a receiver 50 ft. away. The pipes were of cast-iron, 6 ins. inside diameter, and had flanged joints, the joints being made with india-rubber insertion screwed up between the flanges. The compressing cylinder was 24 in. in diameter by 4 ft. stroke, and air was compressed up to 50 lb. per sq. in. The cylinder was fixed in a tank containing water, but no other method was used for cooling the air during compression. The temperature of the air leaving the compressor was found to vary between 320 deg. and 370 deg. Fahr. when compressed up to 50 lb. per sq. in. The receiver was blown off daily. Some little time previous,the pipes leading to the receiver appeared to be unusually hot, and soon two of the pipe joints between the cylinder and the receiver began to blow, while sparks were blowing with the air out of the joints, and the pipe was nearly red-hot. On taking out the joints they were found to be charred and burnt through, and the interior of the pipes was coated with a charred deposit, doubtless the residue of the combustion of lubricating oil which had been used in the cylinder. The oil ordinarily used was lard oil, but, owing to a temporary want of this latter, for a short time previously, use had been made of a mixture of a heavy mineral oil (high flash point) with an oil bought as "colza." The "colza" oil was chiefly made up of thickened cottonseed oil and intermediate mineral; its specific gravity was .91, and it had a strong mineral bloom, and flashed at 295 deg. Fahr. The author compared the circumstances of the two cases, and concluded that the flash point of all oil used in air-compressing machines should be tested, or a guarantee should be obtained from the maker.

Extracts From an Engineer's Note-Books.

No. II.

The Cost of Masonry in Detail.

The Legislature of New York, in 1840, appropriated $9,000,000 to complete the enlargement of the Erie Canal, and the entire work was put under contract. But the courts, later, declared the law unconstitutional and the Legislature directed that all contracts be cancelled, and that the contractors should be paid the amount of profit they would have made had they completed the contracts.

To furnish a basis of settlement, each of the Division Engineers on the State canals was called upon for a detailed estimate of cost of performing the remainder of the contract work. As much of the work was of a like character, tables of values were then agreed upon by the Canal Board and varied slightly to meet the conditions in each case.

The table here submitted is that prepared by Mr. MCALPINE, as then Division Engineer of the Eastern Division, 14 miles in length, and embracing 18 double locks, a long aqueduct and many bridges, culverts, etc. The stone used in the masonry was limestone from the lower Mohawk valley and the masons and stone-cutters were then paid $2.25 per day, and skilled laborers, $1.00.

The tables thus prepared have an especial value, because they deal in large quantities and are the result of the observation of a dozen or more of leading engineers of the canal who had, in most cases, many years of experience in the several kinds of work dealt with. And moreover, before being adopted, these tables were submitted to the cross-examination of the attorneys of the contractors who represented that side of the case. In the final adjustment, the Canal Board substantially confirmed the estimates of the engineers, and the actual awards of damages, amounting to several million of dollars, were based upon them. Other similar estimates on the cost of earth work, rock excavation, etc., will follow.

I. DATA FOR CULVERTS AND BRIDGES.

(Masons and stone cutters paid $2.25 per day; skilled laborers, $1. A days work was 12 hours less one hour for dinner.)

Class of work.	Face stone		Ring and Coping		Backing		Arch	
	* cu. yds. per man.	Cost per cu. yd.	cu. yd. per man.	Cost per cu. yd.	cu. yds. per man.	Cost per cu. yd.	cu. yds. per man.	Cost per cu. yd.
Quarrying	1.00	$2.25	0.60	$3.40	2.00	$1.00	1.00	$2.25
Cutting	1.50	2.25	0.55	5.00	—	—	0.88	3.25
Laying up	0.70	1.25	0.58	3.00	1.75	1.00	0.70	1.25
Mortar	....	.75	....	.50	....	1.25	....	1.00
Tot. per cu. yd.		$6.50		$11.90		$3.25		$7.75

*This column gives the cubic yards per man per day, including drills, foremen, etc. etc.

Centers for arches; 4 to 8 ft. chords, 50 cts. per cu. yd. of masonry; 10 to 15 ft. chords, 75 cts. per cu. yd.

Hauling stone from quarries to canal, 1 mile, 7 loads per day of ¾ cu. yd. each, amounted to 50 cts. per cu. yd. hauled.

Foundation timber and planks; labor in placing $4 per 1,000 ft. B. M. *Trusses*, timber and planks, labor $7 per 1,000 ft. *Wrought-iron bolts*, 3 cts. per lb.

II. DATA FOR LOCK MASONRY.

(Cutstone face, ⅛ in. joints; Hammer-dressed backing 1 in. joints. Masons and stone cutters paid $2.25 per day, skilled laborers, $1 per day. Days labor, 12 hours.)

Class of work.	Face stone		Backing	
	* cu. yd. per man per day.	Cost per cu. yd.	cu. yd. per man per day.	Cost per cu. yd.
Quarrying	0.67	$3.00	1.00	$2.00
Cutting	0.50	5.50	1.80	1.50
Laying up	3.00	0.83	4.00	0.62
Mortar	....	.50	....	.75
Machinery	....	.35	....	.35
Total per cu. yd.		$10.08		$5.12

*This includes drills, foremen, etc. as before. The average cost of total volume of lock masonry, including face and backing, was $7.10 per cu. yd., exclusive of transportation, which in this case was $2.75 per cu. yd.

III. DATA FOR AQUEDUCT MASONRY.

The actual cost of laying up this class of masonry was as follows:

For 5.9 cu. yds. of pier masonry, the services were required of—1 mason, $2.25; 2 tenders, $2.00; and ⅛ stone-cutter, $1.20 = $5.45; divided by 5.9 cu. yds. = $0.92 per cu. yd. as cost of laying.

For 8.95 cu. yds. of arch masonry, the laying require—1 mason, $2.25; 2 tenders, $2.00 and one stone cutter $2.50 = $6.75; divided by 8.95 cu. yds. = $0.76 per cu. yd., cost of laying.

For 8.36 cu. yds. of spandrel masonry, the laying required—1 mason, $2.25; 2 tenders, $2.00 and 1¼ stone cutters, $4.00 = 8.25; divided by 8.26 cu. yds. = $1.00 per cu. yd., cost of laying.

To the above items must be added, cost per cu. yd. of machinery, $0.25; mortar, $1.00; quarrying, $2.25, cutting, $2.25, and transportation, $2.00; amounting to $7.75 per cu. yd.

IV. CARPENTRY.

Coffer-dam. In 830 days of skilled laborers and a few carpenters there were put in the work 157,550 ft. B. M. of timber and plank. This amounts to 190 ft. per man per day.

Aqueduct Trunk. In 3,153 days work (two-thirds carpenters and one-third skilled labor) there were put in 892,400 ft. B. M. of timber, and 260,300 ft. B. M. were framed. The average for each man was—648 ft. B. M. in framing; 324 ft., putting in the work and 206 ft. in framing and putting in place.

Railways in Japan.

The lines of railways open, according to a consular report, are as follows:

Tokio to Yokohama, 18 miles, opened 1872, cost $2,855,732; Kobe to Otsu, 58 miles, opened 1874 to Osaka, 1876 to Kioto, 1880 to Otsu, cost $7,763,500; Tsuruga, to Ogaki, 49 miles, opened 1882 to Yanagasi and Nagahama,* 1883 to Sekigahara, 1885 to Ogaki, cost $2,981,102: Tokio to Mayebashi, 68 miles, 1883 to Honjo, 1884 to Takaski and Mayebashi, $2,323,302; Shinagawa to Akabane, 13 miles, opened 1885; Omiya to Utsunomiya, 50 miles, opened 1884, cost $502,216;† Takasaki to Yokogawa, 18 miles, opened 1884, cost $350,325; Handa to Nagoya (including extension to Kiyosu), 30 miles, opened 1885, cost at present $897,912; Naoetsu to Sekigawa, 18 miles, opened 1886, cost at present $237,467.

The following lines are under construction or in contemplation: Between Ogaki and Kiyosu, about 10 miles; between Yokogawa and Sekiyama, about 80 miles; between Yokohama and Nagoya, about 120 miles; between Nagawama and Ishitashi, about 40 miles; between Utsunomiya and Sendai, about 150 miles; between Sendai and the port of Shiogama 10 miles.

THE CHICAGO CAISSON for the new lake tunnel seems to be fixed for the winter, according to the *Tribune* of that city. It is said no effort will be made to raise and tow it out this year; and in the meantime there will be no tunneling from the lake end for awhile, and the entire work will be delayed correspondingly.

*The tunnel was completed in April, 1884.
†Exclusive of bridges afterwards constructed.
‡Nine months.
§Six months.
‖Nine months.

CORRESPONDENCE.

Strains in Dams.

118 *Park Row*,
BROOKLYN, N. Y., Dec. 3, 1888.

EDITOR ENGINEERING NEWS:

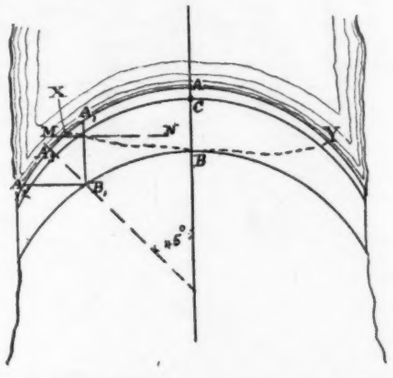
From your remarks on my letter of Nov. 20, published in the last number of ENGINEERING NEWS, you seem to infer that I seriously approved the resolution of forces indicated in the diagram accompanying said letter. I had no such intention; as in deed I thonght the last sentence of the letter made evident.

I only thought, and still think, that it is quite as correct to make such a forced resolution of stresses for a straight dam as for a curved one, ignoring all arch action. I do not see why you bring in the arch action at all in your reply, as it is quite foreign to the point under discussion,—you specifically disclaiming any assistance from such action in the decomposition of forces, in your article of Nov, 17, by saying: "The correct method of analyzing the strains in a curved dam * * * * which has no reference whatever to any possible arch action, etc."

I did not express, or intend to express, any opinion for or against the value of curved dams with full gravity section as compared with straight ones,—but only to carry, as I thought, to a legitimate conclusion your peculiar method of thinning out the gravity section.

I do not claim or believe that a mass can resist by gravity two horizontal forces acting in different directions, if one alone would almost overturn it (unless the mass should have such a shape as to have a longer leverage for its weight in the direction of the resultant of the tier forces); or that the margin of safety would not be reduced if the forces were not overturning ones, as you would seem to claim in saying (p. 390 column 3) "there would be a certain considerable part of the face * * * * where the mass *H H* would act merely as a gravity dam of large section."

Now let us suppose a curved dam, as in sketch with a little over 90° of arc, and of uniform height, —the thickness of the dam being constant in vertical planes parallel to the main axis of the dam, as you purpose. Then at the point *B*, 45° from the main axis of the dam, it strikes me that the condition of things would be almost precisely similar to that indicated in the diagram of my previous letter. The section $A_1 B_1$ and $A_2 B_1$ are almost precisely alike, the overturning stresses on the two planes identical, the resulting toe pressure at B_1 practically the same as in the straight dam, and the normal section $A_2 B_1$ has been thinned down to almost the same amount as indicated in my diagram of straight dam—the only difference being a slight increase of thickness from the convexity of the up stream face. Now it is true that as B_1 approaches *B* the pressures in direction $A_2 B_1$ become less and less, but they are still there and must increase the toe pressure,—the difference being in decree not in kind; section $A_2 B_1$ is also increasing, making the factor of safety for overturning greater with the increased normal thickness of dam;—but this only amounts to saying that the farther you go away from the center, where the normal thickness is a maximum, the weaker the dam is. As I said before, I decidedly object to the assumption that the same material in the dam can be utilized to resist by gravity forces in two directions, with an overturning tendency, without diminishing the factor of safety.



Now with regard to your point made that the line of toe of dam is more of a straight line than a curve,—any vertical section *M N*, made at right angles to axis of dam and below (down stream from) central point of crest *C*, *must have a toe to it*, not at the bottom of the masonry, of course, but a toe all the same. Near *C* the toe would be but little below the crest, but the farther one section is from *C* the lower down will be this toe: and at whatever level the toe may be, the resulting pressure upon it from the two forces must be greater than at the same level on section *A B*,—in other words, the factor of safety is diminished, and for rotation as well as for maximum pressure. As before, this diminution of strength and safety reaching deeper and deeper, the factor of safety decreases as the wings are approached, where your principal saving of material is made.

J. F. FLAGG.

[Our correspondent's closing statement is, we think, mistaken. The principal saving is not at all in the wings, where the mass is comparatively trifling, but in the great central base of the dam, which was thickened 6.7 per cent. beyond that necessary for a straight gravity section, and then computed in some strangely erroneous manner by which some 10 per cent.

or more additional volume was obtained. As for the main argument of our correspondent's letter he seems to ignore the fact that we expressly excepted that part of a theoretical dam in which such conditions as he shows at the point B_1 could occur, drawing attention only to the fact that *in the actual dam there was no such point.* In other words the actual form $X\,B\,y\,A$ (the dotted line $X\,B\,y$ having been added by us to the diagram) the only difference being that the total central angle included is larger. By throwing the line $x\,y$ further down and omitting the arc $B\,B_1$ the total central angle is included and the conditions which exist in any actual dam represented. The diagram, copied from our own, represents a purely imaginary condition of a dam closing a rectangular opening, equally deep at the ends and the middle. In such a dam conditions like B_1 would exist at the ends, and we expressly excepted all such part of a theoretical dam from our reasoning. If our correspondent will take the case of the actual dam and try to find some point at which the foundation pressures will be increased above the maximum toe pressure in the straight dam by the conditions we have proposed, we think he will see a new light. We have, however, stated our position as clearly as we know how to already, and cheerfully afford our correspondent and any one else the opportunity to do the same, leaving the profession to judge between them.—ED. ENG. NEWS.]

Competitive Railway Building in New England.

HILLSBORO CENTRE, N. H., Nov. 30, 1888.
EDITOR ENGINEERING NEWS:

The forbearance of the management of the Old Colony Railroad of Mass. in the matter of encroaching on the territory of the Boston & Providence Railroad, noted on page 408 of your journal, while an anomaly in railroad practice, *may have been* in part the result of advice from the railroad commissioners or induced by the ownership of considerable blocks of stock in the last named road by men high in authority or influence in the first named road. While most of the railway managers of New England would decline or avoid the unscrupulous practices frequent in other portions of the country, at least on their own roads, the occurrences of the last four years in this State, and particularly of the year 1887, indicate that millennial methods have not become altogether prevalent in this part of the country as yet. Yours truly,

L. W. DINSMORE.

Vertical vs. Inclined Caisson Sides.

KANSAS CITY, KAN. Nov. 28, 1888.
EDITOR ENGINEERING NEWS:—

In your issue of Nov. 24, is an article in the "Proceedings of the American Society of Civil Engineers" discussing the merits of vertical and inclined sides to coffer dams or caissons while being sunk stating; "that nobody could say really what effect the form does have".

My experience in sinking the caissons for the Chicago, Kansas & Nebraska R. R. bridges is that should the cutting edge be forced in the slightest by external pressure it is almost impossible to force it down owing to the friction of the ground; while if the sides have a batter of about an inch to a foot, the coffer dam will sink when it is undermined, with weight sufficient to overcome its buoyancy, and in case of a freshet will not rise of its own accord, being dove tailed into the bottom. The material was generally sand and mud. Yours truly

A. CLIFFORD THOMSON, C. E.

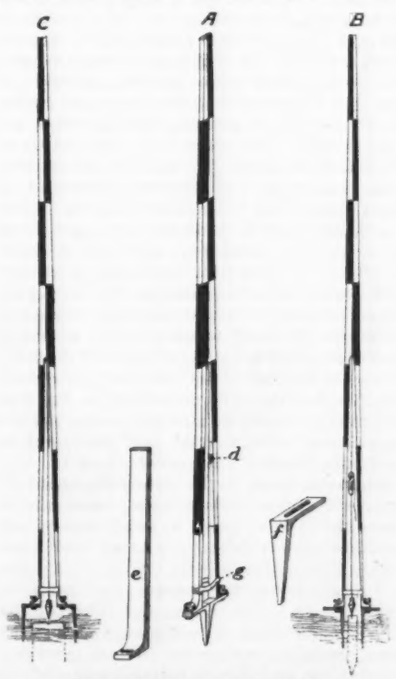
[The discussion before the Am. Soc. of Civil Engineers, referred to by our correspondent, dealt rather with the vertical descent of a caisson through a *great depth* of material. In large caissons sunk by the use of compressed air through comparatively shallow beds of material, and particularly if boulders are encountered, the general practice calls for a slight batter. The advantages are the decrease in friction on the sides and the possibility of removing obstructions that might otherwise "hang-up" one side of the caisson. To some extent the same advantages hold good in a caisson that is to be dredged down to depths of 120 ft. or more; but the question is raised whether these advantages are not more than counterbalanced by the loss of a vertical guide in the undisturbed material and by the tendency of an inclined cutting-edge to move horizontally in decending through material of uneven density. This latter point is the one in dispute, and from the few cases found in practice is yet undecided. ED. ENG. NEWS.]

An Adjustable Engineer's Pole.

PHILADELPHIA, Oct. 23, 1888.

EDITOR ENGINEERING NEWS:—

It has been my intention for some time to present to the profession my "Adjustable Engineer's Pole," which I have found very convenient, and of great advantage in city surveying, and in test triangulation. We have to plant the pole so often in order to keep instrument in range for setting intermediate points, (when using the ordinary pole and plant ing it behind a marble stone marking street lines,



An Adjustable Engineer's Pole.

that it requires great care to get it in correct range, and much time is spent in doing so. Every engineer knows how careful he is to have his instrument centered over a point, but how seldom does he sight to the same point on the backsight that he has occupied.

In ordinary triangulation having planted the pole behind a district stake, he can not from any two triangulation points, sight to the same point without going ahead and resetting the pole so that the line of sight will intersect over the tack. To obtain correct angles he is obliged to have a man for each pole, and then they are not on hand when he wants them. I have used this pole adjusted over the center and closed polygons with very slight error. My sight is always to the point. The pole is very easily handled, its weight being 4¾ lbs. length 8 ft. (*A*) shows pole for ordinary use, (*B*) when adjusted over a stake, (*C*) when adjusted over a marble stone, size 5 ins. The principle of its adjustment is that of the old Draper Transit head, slot in chair marked (*e*) is at right angles to the face of pole, the slots in prong marked (*f*) are parallel to face, the cross piece marked (*g*) is made in the way shown in drawings, giving room for plumb-bob to swing, and acts as a spring when prongs are forced in the ground; as they will not always go in parallel, the spring allow them to spread and takes the strain off of the chairs. In drawing (*d*) is a pocket for plumb-bob which is placed a little above the center of the opening. When bob is in the pocket it spreads the pole sufficiently to force the prongs together. When pole is to be adjusted over a stake, a little pressure forces the prong into the ground; the plumb-bob is then taken out from the pocket and pole adjusted to center over tack. After the pole is removed, and before the plumb is placed in pocket, stretch the string over center of cross piece; with a little tap the prongs are brought in correct line with center of pole; tighten the thumb screws, and your pole is ready for ordinary use.

If any in the profession are interested, and feel in need of a similar pole, I will forward details for making them, or I can furnish the pole at a reasonable price. C. E. ALBRIGHT, Jr., C. E.

Wood Treatment Tests.

Lehigh Valley R. R. Co. Office Asst. Engr.
SOUTH BETHLEHEM, Pa., Nov. 23, 1888.

EDITOR ENGINEERING NEWS:

Your issue of Nov. 3 contains a letter from Mr. F. C. PRINDLE referring to the report on "Wood Treatment Tests", made at Perth Amboy, N. J., and published in ENGINEERING NEWS, Sept. 1.

Mr. PRINDLE states that he has personally addressed the Chief Engineer of the railroad, asking for additional information and that he has received no reply. It is possible that a letter from an unknown party to the Chief Engineer of a large railroad, upon a subject not pertaining directly to the business of the company, may have lain unanswered during the press of other work.

I also wish to state that I, as engineer in charge of the work, have never been addressed by Mr. PRINDLE regarding the matter. Also that the first intimation I had of Mr. PRINDLE's inquiries was through the columns of ENGINEERING NEWS.

The tests in question were instituted by the Chief Engineer of the Lehigh Valley R. R. and made in the interests of that company by myself, as mentioned in the report, and were not connected with any creosoting company, nor were they made in the interests of any particular process.

The report was not written with a view to publication, but later, thinking that it might be of interest to others, it was sent to ENGINEERING NEWS. It was simply a statement to a superior officer who was fully acquainted with the different kinds of antiseptics, the quantity employed and the methods of preparing the timber for treatment. On this account it was not considered necessary to go into those details in the report.

The creosote specimens were prepared in the usual way, by what is known as the "Hayford Process", or the process commonly employed in America. They were treated with batches of similar kinds of timber containing 12 lbs. per cu. ft. of oil. The "creosote oil" was what is commercially known as "dead oil of coal tar" and was taken from the tanks of the creosoting works where they were treated.

The manner of treating the timber with "fernoline oil" and "coal oil residuum", was to soak the specimens in the fluid until they had finished absorbing it. The "coal oil residuum" when cold is somewhat stiff, it was therefore heated until perfectly limpid before immersing the timber in it.

The "coal oil residuum" and the "fernoline oil" (wood creosote) were bought through the purchasing agent of the company, and were considered average commercial samples.

I will also say that the tests were partly made to arrive at a comparison of the work done for the company by two different creosoting companies, specimens of actual lumber treated by both companies being among the specimens.

In conclusion it may be well for me to add, that it is intended to make an annual examination of these specimens. Also that I do not consider the results of the examination as entirely conclusive, on account of the short time the timber was immersed, and that the value of the experiment will become greater as years increase.

Yours truly,

LOUIS FOCHT, *Ass't. Engr.*

ENGINEERING NEWS

AMERICAN RAILWAY JOURNAL

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D. MCN. STAUFFER, A. M. WELLINGTON.
EDITORS.

GEO. H. FROST. - - - - - BUSINESS MANAGER.

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Drawings for publication *should preferably be in plain black and white, considerably larger than they are expected to appear, with letters and figures in pencil only, all lines clean and bold.*

Coming Technical Meetings.

Civil Engineers' Club of Cleveland, O.—Regular meeting, Dec. 11. Report on Railroad Engineering. Secy., James Ritchie, Case Library Rooms.

New England Railroad Club.—Next meeting at Boston & Albany R. R. passenger station, Boston, Mass. Dec. 12.

New England Water-Works Association.—Regular quarterly meeting at Young's Hotel, Boston, Mass., Dec. 12. Secy., R. C. P. Coggeshall, New Bedford, Mass.

Engineers' Club, Philadelphia, Pa.—Regular meeting, Dec. 15. Secy., Howard Murpey, 1122 Girard St.

Engineers' Society of Western Pennsylvania, Pittsburg, Pa.—Regular meeting, Dec. 18. Secy., S. M. Wickersham.

Boston Society of Civil Engineers, Boston, Mass.—Regular meeting, Dec. 19. "Efficiency and Economy of the Graphic Method in Surveying," by Willard D Johnson, U. S. Geological Survey; "Stadia Work," by J. R. Freeman. Secy., S. E. Tinkham, City Hall.

Engineers' Club of St. Louis, Mo.—Regular meeting Dec. 19. "Changing the Gauge of the Ohio & Mississippi Ry.", I. A. Smith. Secy., Wm. H. Bryan, 709 Market St.

American Society of Civil Engineers, New York.—Regular meeting, Dec. 19. Secy., John Bogart, 127 E. 23d St.

New York Railway Club.—Next meeting Dec. 20. Rooms 113 Liberty St., New York City.

Civil Engineers' Society of St. Paul, Minn.—Regular meeting, Jan. 7. Secy., Geo. L. Wilson, City Hall.

Engineers' Club of Kansas City, Mo.—Regular meeting, Jan. 7. Secy., Kenneth Allen, Y.M.C.A. Building.

Western Society of Engineers, Chicago, Ill.—Regular meeting, Jan. 9 Secy., L. E. Cooley, 171 La Salle St.

WE are compelled by the pressure on our space to postpone to a following issue the conclusion of our articles on the Canadian Pacific Railway.

WE are informed by an officer of the Baltimore & Ohio Railroad that injustice was done to that road in ascribing to it the responsibility for the "small bridge failure" illustrated and described by a correspondent on page 393 of our issue of Nov. 14; the bridge not having been in fact built by the B. & O., nor being now on a line controlled by them. The circumstances under which the confusion arose were somewhat peculiar. The road was built and known as the West Youghiogheny Branch of the B. & O. R. R., and the B. & O. built and erected two *iron* spans at the locality in question, the east end of one of which appears on the right in the photograph and our illustration. From this point eastward to a connection with the Pittsburg Division of the B. & O. a temporary wooden trestle was built, pending the erection of permanent iron spans over the remainder of the waterway. In this condition, and about the year 1882, this branch was sold to another railroad company (Pittsburg, McKeesport & Yough' Ry.) operated by a rival system. In the summer of 1884 the temporary trestle was carried away by a freshet and replaced with three short wooden Howe truss spans, of the poor design shown in our illustration, the failure of one of which was discussed and illustrated on the page referred to.

The bridge was ascribed in the press dispatches at the time of its failure to the B. & O. and we were ourselves deceived thereby at the time, in our news summary of the event, on page 99 of No. 32 of the current year; publishing a correction on page 139 of No. 34; but although editors are supposed to know everything *ex officio*, they can hardly be supposed to remember everything, especially when matter passes through different hands; and the fact escaped our recollection in publishing a later communication on the subject. An apology, therefore, is due from us to the officers of the B. & O. R. R. and especially to its engineering management, which we cheerfully tender.

THE Jersey City Water Supply question, just now, seems to have fallen into the hands of a few unmitigated cranks, judging from late reported proceedings. That city wants a new water supply badly; but the citizens should either legitimately and legally go about securing one for themselves, or they should calmly and intelligently discuss any offers made by private corporations proposing to furnish such a supply. Mob law and threats to hang the promotors of a contract with private parties to the nearest lamp-post only make ridiculous the parties advising such a course, and postpone the wished for end. The 175,000 inhabitants of Jersey City will have water from some source; and if they are prevented by legal enactments from expending the money the scheme may demand, or cannot have these legal bounds expanded, they will probably go to private parties for what they must have and cannot otherwise obtain. We do not approve, however, of a contract with private corporations for large water supplies, except in case of absolute necessity. The only economy in such a disposal of the question is one of administration, the difference between the construction of the works and the conduct of the business as a commercial enterprise, and its manipulation as a local political power.

While this is one of the strong arguments in favor of private control, this power can be abused in private as well as public hands, and in either case it is the consumer who must suffer. Though it is a little utopian to assume the possibility in the present organization of many of our larger cities, the effort of the citizens should rather be first expended in the direction of securing honest and intelligent representatives, and then in building and controling their own public works in such manner that all gain is their gain. If the people can put no faith in their municipal fathers, then let them look outside for purveyors of any public commodity. But in granting privileges to such private parties, they should look to it that any contract is carefully drawn in such manner that the people do not lose control of a property that should rightfully be theirs alone, and so framed that any abuse of privilege can be promptly checked. The new water supply of our neighbor is a broad and many-sided question; but the Committee of One Hundred, in Jersey City, is not going about its solution in the proper way.

THE decision by which Cornell University has been deprived, for a time at least, of a legacy of a million and a half of dollars may be good law but it certainly is not good sense. It rests solely upon the ground that the University is not entitled by its charter to hold more than $3,000,000 worth of property, and that it already holds that. The latter is denied, but the former seems to be admitted; and if such a disability exists an effort should be made to have it removed as speedily as possible. It is monstrous that when there is nothing to prevent the most worthless individual from holding any amount of property which any one chooses to leave him, although a single million is more than enough to cover what any family can use well, an institution of learning which exists only for the public good and which is not well endowed until it has considerably more than $3,000,000 of property should be deprived by law of what has been freely given to it. Prof. FISKE, who, as a poor professor, married the rich wife who made this legacy, after amply providing for all natural claims; and who, after first assenting to the legacy, set up this claim after a quarrel with the Faculty, cuts rather a poor figure in this business, as the instigator of an effort to defeat by technicalities the wishes of his own wife to whom he owed so much; and well deserves, what he is no doubt receiving in full measure, general contempt. It is possible that the U. S. Supreme Court may cause a reversion of the decision.

THE American-Chinese railway scheme, of which we heard so much about a year ago, it seems, is to be revived by a personal visit of MR. WHARTON BARKER to China early next year. The trouble has apparently been that Count MITKIEWICZ, the agent of the American syndicate, was altogether too liberal in his promises of material aid and comfort to the Chinese officials interested in procuring the original concessions. These promises could not be redeemed, and the hitch which followed is now in process of being straightened out, with bright prospects of ultimate success, according to our Philadelphia exchanges.

IN the meantime the somewhat threadbare announcement is again being made that "the first railway" in China was opened on Nov. 9. The *Chinese Times* describes it as a line 81 miles long, from Tien Tsien to Leital, with 5 miles of sidings and branches; but it does not say under whose auspices this particular line was built, though it is probably the China Railway Co's line to the Hai Ping mines. The Chinese are being slowly, but very slowly, educated to the advantages of railways. National prejudice is decidedly against their introduction, and despite the proclamation of Li-Hung-Chang, which last May almost ordered the Chinese to take stock in apparently the same line now reported as opened, they declined to invest. The natives fear the effect of railways upon the labor and shipping interests, and can not yet conceive that any official will honestly administer the affairs of such an improvement, and can still less imagine a division of profits with the shareholders; and from the reported methods of the average Chinese office-holder, the Chinese public can hardly be blamed for their lack of faith. One of the odd, but really important, obstacles in the way of railroad building in that country is the decidedly promiscuous practice of burying the dead along the roads, about the houses, in the fields and in almost every conceivable spot. The difficulty of avoiding these depositories, and the intense veneration for their ancestors held by the Chinamen, make railway location there a very different task from similar work in other countries. But the point of the wedge has been inserted, and as soon as some of the many advantages of railways can be practically demonstrated, the strong commercial instinct of the Chinese will materially assist in overcoming tradition and national doubt or prejudice.

MR. ARCHIBALD A. SCHENCK, of the Oregon Pacific Railway, Corvallis, Ore., sends us a new form of construction field-book (not copyrighted, and open to imitation by any one), which we can well imagine may "fill a long-felt want", by furnishing a convenient blank book for the record of all kinds of construction notes in compact form. It is considerably narrower and thicker than the ordinary field-note-book, and opens on the inside cover with a table of sines and tangents for even degrees, followed by some brief and well put "Instructions for construction notes." Just inside the back cover, similarly, are two pages of "Instructions for instrument work." The first blank page is for a record of the position, names and addresses of the party. Then follow 10 double pages for a complete record of alignment; then 8 double pages for a very complete record of benches, including all tests of them; then 40 or 50 double pages for elevations and cross-section notes, and the remainder of the 400 pages are left blank for records according to local circumstances, the book closes with an index by "Date, Station, Item, Page." The cover is red, to distinguish it from other note-books. We should judge the book might serve a very useful purpose, but it would be a great improvement to have all the pages ruled in squares instead of merely lined.

The Present Financial Status of the Panama Canal Co.

The general fact that the affairs of this company are now in a most critical condition, that recent efforts to raise money have dismally failed, and that a sudden and complete collapse is possible at any time, has been clear to all the world which takes an interest in the affairs of the Panama Canal Co. for some months at least; but precisely how the company stands to-day is something which few have any definite idea of. We are spared the weary work of attempting to ascertain this (which we should hardly undertake again) by an editorial article which appears in the *Evening Post* of Nov. 3, written evidently by some one who has made a careful study of the affairs of the company, and which contains the following balance sheet, starting from M. DE LESSEPS' report to the general assembly of shareholders on Aug. 1, 1888, which brought the company's affairs down to June, 30, 1887, and bridging over the intervening 16 mos. to Nov. 1 from various official statements and announcements referred as stated in the foot-notes to the balance sheet which we give below, by numbered references:

APPROXIMATE BALANCE-SHEET OF PANAMA CANAL CO. TO NOV. 1, 1888.

[The numbers (in parentheses) following each amount refer to the foot-notes below for authority.]

ASSETS.

Cash on hand on January 1, 1888	$22,000,000	(1)
Proceeds of loan of March 1, 1888	10,000,000	(2)
Proceeds of 354,200 lottery bonds at $72	25,502,400	(3)
Proceeds of 500,000 lottery bonds at $24	12,000,000	(3)
Total assets	$69,502,400	

LIABILITIES.

10 mos. interest on capital stock	$2,500,000	
do on 3 per cent. bonds	1,680,115	
do on 4 per cent. bonds	1,635,000	
do on new bonds, first series	3,294,010	(4)
do on new bonds second series	1,812,268	
do on Panama R. R. loan	1,067,983	
Loan of March 14, 1887, guarantee fund	1,447,150	
do interest	336,000	
Loan of June 26, 1888, guarantee fund	20,000,000	(5)
do interest	520,866	(6)
Loan of June 26, 1888, prizes drawn Aug. 16, Oct. 25	226,000	(7)
Contractor's work on the Canal line	$50,000,000	(8)
Payments under Eiffel contract	8,333 333	
Water supply for summit level	833,333	(9)
Purchase of machinery and material	2,777,777	
Administration on the Isthmus	2,000,000	(10)
Administration in Paris	333,333	
Sundry creditors	7,040,000	
Coupons unpaid	1,280,000	(11)
Acceptances	200,000	
Total liabilities	$107,787,168	
Deduct total assets	69,502,400	
Balance Dr.	$38,284,768	

It is added as a comment on this balance sheet:

"It will be observed that no charge is made against the company, in this balance-sheet, for expenses of issue of the loans of March 14 and June 26. These expenses have been placed as high as 10 per cent. by Paris correspondents of English newspapers. If we estimate them at one-quarter of this percentage, they amount to over $4,000,000 and raise the company's deficit to $42,000,000.

"If M. DE LESSEPS should succeed in placing the entire 1,140,000 of the unsold bonds at 350 francs, and should realize the whole amount, he would only have enough left, after clearing off this debt, to pay interest and expenses to the end of 1889. There would be nothing for work on the canal."

However we look at this statement it does not seem possible so to modify it as to greatly diminish the gravity of the situation. One or two items seem somewhat questionable. For example, it will be seen at once that one very large item in the aggregate (as it naturally should be) is the allowance of $50,000,000 for contractor's work on the canal line, the authority for which is merely a loose statement by M. DE LESSEPS that they "were spending 20,000,000 to 25,000,000 fr. per month", or $4,000,000 to $5,000,000. It seems quite certain that they cannot have been spending even the smaller sum in fact, for they have not had it to spend, and all accounts from the Isthmus are that there has been comparatively little going on there outside of the lock work.

On the other hand, there should certainly have been quite a considerable sum included for the expenses of placing the late loans. At the very moderate allowance of 5 per cent. on $47,502,400,—the amount realized from the two loans of 1888,—for banker's commissions, advertising, legislative propaganda and all other expenses of issue, we have an additional debit charge of $2,375,120. It is much more likely to have been twice that, especially in view of the revelations noted in our news column, which had just come out last week, as to alleged wholesale bribery of legislators and high officials. Such bribery need not all have been done by the direct handing over of money, but the indirect methods of corruptly obtaining "influence" are even more costly than the direct.

As to how much of the above referred to item of $50,000,000 should properly be included, we have some evidence in an official pamphlet giving the "*Situation des Travaux au 25 Aout*, 1888", which lies before us, and which was prepared by the company to aid in floating its late loans. It divides the canal into 5 different sections, starting from the Atlantic end, and gives for each successively the cube extracted up to Jan. 1, 1888, from the beginning of the work; the amount done since that date up to Aug. 25, 1888, and the amount admitted to remain still undone. The statement bears almost positive evidence that it is in some respects inexact; and quietly passes over without notice some little matters like the control of the Chagres River among the work to be done beyond question, yet it puts the amount of work done this year as high as it can be put.

But the reckless and slipshod way in which the affairs of the company are conducted is strikingly illustrated by the fact that this statement is not consistent with itself even on the same page. To adapt it, apparently, to the meanest intelligence, it gives a little "*Graphique des Cubes*" under a map of each of the sections, a small piece of cross-section paper, ruled in little 2 millimetre squares, being hatched and cross-hatched to represent (1) the work done up to Jan. 1, 1888, (2) the work done Jan. 1 to Aug. 25, 1888, (3) the work remaining to be done Aug. 25, each little square representing 10,000 cubic metres. On the areas for the last two items the quantities are likewise given in figures; and on a statement of this kind, expressly prepared to reassure doubting Thomases, we should naturally expect that there would be sufficient exactitude and care used in preparing the statement to have 435 squares, for example, hatched to correspond to the 4,350,000 cu. m. recorded in figures, or 863 squares to represent 8,626,000 cu. m. This, however, is not the case, the variations being often disgracefully flagrant. Thus, on the first section (kilos. 0 to 22.5) we have,

	By the "*Graphique*"	By the Figures.
Work done to Jan. 1, '88.	23,750,000 cu.m.	not given.
" undone "	8,360,000 "	8,626,000
" done Jan. 1 to Aug. 25	4,270,000 "	4,350,000
" undone " "	4,000,000 "	4,276,000
Total work	32,110,000	32,376,000

Most of the other sections are worse, as shown below. Which of these statements is correct, or if either is, it is impossible to say; but following the *Graphique*, which is our only authority up to Jan. 1, 1888, we have:

"*Graphique des Cubes*".

Section.	Kilometre	Cubic Metres. Exc'd up to Jan. 1, 1888.	Undone Jan. 1, 1888.	Exc'd Jan. 1, to Aug. 25, 1888.	Total cube.
1	0 to 22.5	15,390,000	8,360,000	4,270,000	23,750,000
2	22.5 to 44	3,460,000	6,540,000	1,100,000	10,000,000
3	43 to 53.6	6,570,000	3,990,000	710,000	10,560,000
4	53.6 to 62.2	1,970,000	5,360,000	1,050,000	7,330,000
5	62.2 to 74.5	4,980,000	5,940,000	2,430,000	10,920,000
10 locks	.....	.....	1,260,000	470,000	1,260,000
Totals	.....	32,370,000	31,450,000	10,030,000	63,820,000

The discrepancies between the "*Graphique*" quantities, as given above, and the numerical quantities *given on the same area* of little 10,000 c. m. squares are:

Section	Numerical Quantities Undone Jan. 1, 1888	Exc'd Jan. 1 to Aug. 25, 1888.	Discrepancy from "*Graphique*"
1	8,626,000	4,350,000	+266,000 + 80,000
2	6,952,000	1,499,000	+412,000 +390,000
3	4,000,000	710,000	+ 10,000 *Correct.*
4	5,133,000	810,000	—227,000 —240,000
5	5,547,000	2,028,000	—369,000 —402,000
Locks	1,247,000	480,000	— 13,000 + 10,000
Total	31,505,000	9,871,000	+ 55,000 —153,000

Here no apparent purpose to deceive by systematic errors in one direction is apparent. It is simply slip-shod carelessness, we judge, like the Sunday dates of the Tweed ring bills; the errors being irregular and large, and chancing to nearly balance each other. Let us see how

(1) In his letter to Prime Minister ROUVIER, of November 15, 1887, M. DE LESSEPS stated that the company's cash balance on Jan. 1, 1888, after payment of all liabilities, would be 110,000,000 francs, and this figure appeared as the actual balance in the report to the general assembly of shareholders on March 1, 1888.

(2) Letter of M. DE LESSEPS to Chamber of Deputies April 18, 1888, placing subscriptions to the loan of March 14, 1888, at 50,000,000 francs.

(3) The Syndical Chamber of the Paris Bourse on September 7, 1888, announced the listing of 860,000 of the lottery bonds, "actually placed or forming part of a quantity delivered in settlement to a group of lenders." Accepting the company's statements of the number of bonds exchanged by subscribers to the loan of March 14, and of the number of lottery bonds fully paid, the credit for this issue must be 354,200 bonds at 350 francs, and 500,000 at 120 francs, the amount of the installments falling due prior to Oct. 31, 1888. This and the above include all of the company's holdings and receipts since Jan. 1, according to its own claims and the official record.

(4) These amounts are 10-12 of the known interest charge on the various outstanding loans.

(5). The company has recently made official declaration that the guarantee fund held by the *Société civile* for the payment of the prizes and redemption of the principal of the lottery loan amounts to 103,000,000 francs.

(6.) Computed at known rates.

(7.) Officially announced prizes.

(8.) M. DE LESSEP'S letter of April 18, 1888, "We are spending twenty to twenty-five million francs per month."

(9.) The annual report read to the shareholders on August 1 contained a financial estimate for the completion of the canal, which included 125,000,000 francs for the "execution and installation of the works of art" (locks), 15,000,000 francs for the "water supply for the summit level," and 50,000,000 francs for "installations of every kind and the purchase of material," a total of 190,000,000 fr. or $38,000,000.

(10). The schedule of expenses for two years to July, 1890, included 24,000,000 francs for administration on the Isthmus and 4,000,000 francs for administration in Paris.

(11). The outstandings were unpaid coupons, 6,400,000 francs, acceptances, 1,000,000, and sundry creditors, 35,000,000.

these quantities compare with previous records.

In our issue of June 2, 1888, we discussed "The Present Status of the Panama Canal", and there on the authority of the company's own official statements, found that the past record of the canal had been as follows:

Year ending June 1.		Cash Expenditure	
1881		$30,124,000	before any reports of quantities
1882	1,104,000	15,617,000	
1884	5,500,000	25,059,000	
1885	7,659,000	26,261,000	
1886	10,499,000	30,849,000	
1887	12,413,000	25,000,000	est. '(d.)
Total	37,175,000	$152,910,000	

Total capitalization, apart from lottery loan, $351,150,000

Here, then, by previous reports, we have 37,175,000 cu. m. excavated up to June 1, 1887, whereas by the latest statement, up to Jan. 1, 1888, there had only been excavated 31,505,000 cu. m. What has become of the little difference of 5,670,000 cu. m. + 6 months work, or say 12,000,000 cu. m. in all? Has it been lost by the change of plan from "sea level" to locks, or washed in again by the Chagres, or is it simply another error of book-keeping? What confidence can be put in any statements from a management so loose in its accounts as this? Evidently very little; and therefore the claim above that they have executed in 7 mos. 25 days 10,030,000 cu. m., when the most that they have ever claimed to do in any 12 mos. heretofore is 12,413,000 cu. m.,(and about 25 per cent. of that seems to have in some way disappeared, leaving a maximum year's *net* cube of about 9,300,000 cu. m.,) must be received with some grains of allowance; especially as it has been constantly reported this year that the works of the canal other than on the locks were at a comparative stand-still.

On the other hand, the dredges have always been able to give a good account of themselves, and it will be observed above that the greater portion of the large cube of 1888 is reported on the dredging sections. M. DE LESSEPS also claims above to have been spending twice as much per year in cash as has ever been done before, so that it is conceivable that 10,000,000 cu. m. may have been in fact executed. The statement in which we feel no confidence is that so little as 31,450,000 cu. m. remained to be done on Jan. 1, of this year. The probabilities are rather, as we showed in detail in our estimates of June 2, that there was then 45,000,000 to 50,000,000 cu. m. undone, Chagres work and all included.

It is probable that, if so large a cube has been excavated as claimed, the cash expenditure has been at least $25,000,000; and substituting this sum for the $50,000,000 included in the balance-sheet above, based only on a loose statement of M. DE LESSEPS, and adding to the liabilities $2,375,120 per expense of floating loans we have

Total liabilities	$85,162,288
Deduct total assets	69,502,400
Dr. balance or net deficit	$15,659,888

That this last comes pretty close to the actual present status of the company, we have no doubt. It is not so large a deficit as to disprove itself. It is a sum which could be easily carried in the enormous transactions of the company as floating debt or posponed payments. It is large enough to explain the desperate anxiety which is now shown to raise more funds; and which would be pitiable in a man of DE LESSEPS' age and distinguished career if the continuous misstatements, frauds and mismanagement of the enterprise from first to last had not been so gross as at last to inspire disgust rather than sympathy. Looking at the matter in the best possible light; consider the enormous expenditures shown in the detailed statement above for 10 months' work to accomplish an alleged one-third of the remaining work. Is it probable that the company will be able to duplicate such a balance-sheet twice over in order to complete the work which is admitted to be necessary, and then be able still to raise the money to grapple with the Chagres problem, which is not yet touched at all?

It is certainly possible. France is a proud and rich nation, and the national pride as well as the national pocket is now deeply involved in the completion of the work. As yet the financial expedient known as "scaling down" has not been resorted to, and by postponing all the securities issued to some form of prior lien bonds, all the money needed may yet be raised; but we see no reason yet for deviating from our original estimate of June 2, that before the canal is completed $230,000,000 more in hard cash must be expended on it. By the above statement nearly $80,000,000 of it has already gone to finish one-third of the admitted work. Were not France so deeply embarrassed as a nation, we should look with confidence to see the work completed at public expense, but that is now hardly possible. The Government has enough to do to take care of itself. The present prospects for floating more loans seem very poor. We await with interest, evidence of what substitute therefor will be resorted to.

The Work of the Interstate Commerce Commission.

Many of our readers will remember that at the time the Interstate Commerce law was enacted, while other journals in the railway field were condemning the new law *in toto* and predicting all manner of evils as a result of its execution, ENGINEERING NEWS took a pronounced stand in its favor, as a step in the right direction and one demanded equally by the interests of the public and of the railways.

Recognizing at the time, the crudities and imperfections of the measure and the trouble likely to arise from what we then stated to be "the two most objectionable features of the bill," the long and short haul clause and the clause prohibiting pooling, we believed the assumption by the general Government of the power to regulate commerce between the several States to be an inevitable move, which if delayed too long, until abuses had become deep seated, might be carried too far at the outset and bring disaster. The events of the past two years have fully confirmed the wisdom of our position. With all the fault found with the provisions of the law, and especially just now with the anti-pooling clause, there is hardly an opponent but what will now concede that considerations of public policy and common justice, both to the railways and their patrons, demanded that personal and local discriminations should be done away with.

The best clause of the whole law, however, was that which placed its execution in the hands of a Commission; and it was fortunate that this Commission, which had so important a work to establish, was made up with so excellent a *personnel*. Commanding the respect of both the railway managers and the public, it could and did act as an impartial tribunal, and in general the wisdom of its rulings has been apparent.

But by no means the least important work of the Commission is the diligent study and investigation which they have given to various still unsolved phases of the railway problem, the results of which are given in the forthcoming annual report, a condensed summary of which is given elsewhere in this issue. The questions which are there discussed are vital to the welfare of the railways as well as of the general public. It was hardly possible to make much progress toward their equitable solution as long as their discussion was carried on as a partisan debate between defenders of the railway interests and granger legislators; while the want of a comprehensive knowledge by the judges of our courts of all the complicated conditions of railway management, together with the fact that the cases presented to them involve local rather than general features, prevented our court decisions from helping us very fast toward the light. But this competent and impartial executive tribunal, with legal and technical ability sufficient to sift the wheat from the chaff, has been able to make considerable progress in solving some knotty points, and their arguments and conclusions will be read with interest and respect, if not with acquiescence, by railway men generally.

Good and commendable as is the work which the Commission have accomplished, however, the report still leaves unsettled and indeterminate the question of questions at the present time, how to restore rates to a paying basis. The Commission deny that the law or its administration is responsible for the rate wars which have prevailed during 1888, and their only reference to the working of the anti-pooling clause is an allusion to the fact that pooling is now prohibited. They devote a large space to the condemnation of the practice of rate cutting, and an equal amount to the admirable purpose of proving that unreasonably low rates are an injury to the public as well as to the railways; but they do not discuss the causes of rate wars, and their only reference to a possible cure is an ambiguous statement that at some time in the future it is possible that legislation will be necessary to regulate in the public interest the relations of the carriers to each other. Just what is meant by this it is difficult to say, as the report elsewhere expressly affirms that anything equivalent to the consolidation of all the roads of a country under a single head, or even those of a considerable section, would be contrary to public policy; and as the companies would not be at liberty to form it, of course it would be folly to expect that Congress would provide it for them.

Another sentence which may throw a little light upon the subject is found near the top of page 29:

> "There is nothing in the existence of such [traffic] arrangements which is at all inconsistent with earnest competition. They are of general convenience to the carriers as well as the public, and their voluntary extension may be looked for until in the strife between the roads the limits of competition are passed, and warfare is entered upon."

Competition, then, is to be regarded as an all-around blessing, and warfare as an unmitigated curse! Pray, where is the line between the two to be drawn? Where does the sudden transformation take place? The idea of the Commission, from all we can gather, seems to be that it would be desirable to restrict competition enough to keep the companies from bankruptcy and at the same time permit it to act just enough to keep rates down to an equitable basis. We do not believe that this novel idea has ever been put in practice, and very much doubt if it ever will be. We are at a loss to see how it could be carried out, and predict that an attempt would bring about that instability of rates which the Commission justly deprecate.

It may indeed be possible that the Commission have recognized the fact that they are both the servants and the teachers of an unenlightened public opinion; that they have considered it impolitic to go so far in advance of it as to lose its support, and have, therefore, taken a more conservative stand than that indicated by their own judgment, For there is little doubt, to such a pitch has

"railwayphobia" run in some sections of the West, that if the belief once became prevalent that the interstate commerce law was rather a good thing for the railways, or that the Commission entrusted with its enforcement believed that rates should be fixed without reference to competition, there would be an immediate and powerful movement for more legislation and the appointment of a new Commission composed of Messrs. LARABEE, of Iowa, ANDERSON of Kansas, REAGAN, of Texas, or men with similar principles.

The Commission doubtless could not maintain against public opinion any other position than the one they have taken, that they have authority to protect the public from the railway companies but none to protect the railway companies from each other, though their desire to do so is abundantly shown by the report. It follows then that if the railway corporations are to be brought back to a dividend paying basis, it must be done by the owners and managers themselves. Indications are not wanting that plans to effect this are being elaborated and that the worst of the rate war is over. Surely if it were to continue much longer and stocks were to keep on falling, some enterprising man with a little surplus cash might purchase a controlling interest in all the fighting companies and solve the question of "war or peace" once for all.

It must be fully appreciated that the position and work of the Commission is most delicate and difficult. For the manner in which they have executed it, they deserve ten words of praise to one of criticism. The stand they take on the questions of uniform classification, the payment of commissions, and the effects of the law upon cities are deserving of the highest commendation and should be carefully studied by all railway men interested. As a whole the report is probably quite as far in advance of current public opinion and railway managers' practice as it was politic to make at the present time; and it can hardly fail to have a marked beneficial effect in bringing us nearer to an amicable and satisfactory solution of the problems discussed.

PERSONAL.

Surveyor-General WILLIAM G. BOWMAN died at Salt Lake City, Utah, Nov. 29, at the age of 60.

A. P. TAYLOR, Division Engineer of the Pottsville division of the Philadelphia & Reading, has resigned his position.

SAMUEL CUSHING, M. Am. Soc. C. E., died recently at Providence, R. I., where he had been in charge of bridge work.

Mr. GUNTER, the author of "Mr. Barnes of New York" and "Mr. Potter of Texas", is said to have graduated as a civil engineer from the University College of San Francisco, and to have followed that profession for a short time on the Central Pacific R. R.

CHARLES P. COLEMAN has been appointed Chemist of the Lehigh Valley R. R. Co., with office at South Bethlehem, Pa. He will report to the Assistant to Second Vice-President. All lubricating and illuminating oils, tallow and waste used by this company will be furnished upon requisition of the Master Car Builder, the Master Machinists or other authorized persons, on the chemist of the company.

Capt. GEO. MCC. DERBY, U.S. Engineers, has been recently assigned to duty at West Point. Captain DERBY will be remembered as the officer who so fearlessly and successfully superintened the loading and firing of the mines used in blowing up Flood Roc in the Hell Gate channel at New York. While we thoroughly agree with the late article in the Washington *Herald* commending this officer for his nerve, intelligence and faithfulness to duty and orders, under the conditions surrounding him at Flood Rock, we would remind our contemporary that similar conditions, only lighter in degree, daily surround the hundreds of civil engineers and contractors, who are engaged in tunnel-driving, etc. It is "business" and they get used to it, as did Captain DERBY in his serious and responsible work.

W. D. OTIS, General Roadmaster of the New York Central, has appointed the following roadmasters between Rochester and Albany, N. Y.: J. B. BENNETT, division No. 14, comprising the Auburn road and the Geneva and Lyons branches; M. R. WINFIELD, division No. 11, with headquarters at Lyons, this includes the four tracks from Lyons to Rochester and the East Rochester and Lyons yards; FRANK B. CURTIS, to division No. 6, between Albany and Schenectady.

JOHN REMSEN ONDERDONK, Civil Engineer, died at Chicago, on Nov. 22, while in charge of the new water-works tunnel under the Lake. Mr. ONDERDONK was born in New York on March 22, 1840, the son of J. R. ONDERDONK, also a civil engineer, and a nephew of HENRY ONDERDONK, Bishop of New York. He was educated as an architect, served and was twice wounded in the Civil War and was a Major. His chief engineering has been done, in connection with his brother ANDREW ONDERDONK, in grading 700 miles of the most difficult portion of the C. P. R., and in building the Alameda bulkheads, the San Francisco sea-wall and the San Francisco and Oakland ferry slips.

The Improved Sewerage of New York.

Gen. JOHN NEWTON, late Commissioner of Public Works, presented to the Mayor on Nov. 24 a brief report on the present condition of the sewerage of New York, made with a view to its improvement by Mr. RUDOLPH HERING, Consulting Engineer. This report may be summarized as follows:

Mr HERING says that the original call for an examination arose from the frequent complaints of flooded cellars, obstruction and accumulation of foul matter in sewers, offensive odors and other objectionable features. It was also deemed desirable to ascertain in what direction the present sewerage system could be improved, in location, construction or maintenance.

An examination showed that many of the existing sewers are badly adapted to their purpose and very few are self-cleaning. They have usually rough interiors and the shape is not such as to concentrate the flow sufficiently to produce the scour necessary to remove the heavier substances.

In examining into the complaints of flooding, etc. Mr. HERING found that the size of many of the large sewers had been figured either by using Bazalgette's formulæ or by assuming an average flow of ½ cu. ft. per second per acre to reach the sewer. The results show that while these rules will apply to flat suburban areas and light rainfall, they are not applicable to the densely built up area and heavy rainstorms of New York.

The frequent flooding of certain brick and pipe sewers is due solely to insufficient capacity. In a few low areas in the business sections, such as near West Canal St., it may be necessary to establish pumping stations and low-level, separate systems of pipe sewers to guard against continual flooding.

More attention should be paid to the proper joining of sewers to prevent accumulation and obstruction; pipe sewers should be confined to streets having good gradients, and a regular system of flushing would considerably reduce complaints. Tidal sewer deposits, due to a decreased velocity in the sewage, can be avoided or reduced by improving the shape, raising the sewer or dividing the duty of a larger one over a number of smaller ones placed higher and with steeper grades.

Odors from man holes and catch-basins cannot be wholly obviated by closing the perforations in one and placing traps in the other. The trap is placed between the basin and the sewer. Therefore the odors from the accumulation of filth in the basin can escape directly into the air at the gutter. As it seems inexpedient to place an effective water seal trap between the basin and the gutter, the only proper way to avoid the odor (as well as the occasional flooding of the street due to the filling up of the catch-basin) is to keep thebasin well cleaned. Instead of following the present method of special contracts or day's work for cleaning them, it is much preferable, and is elsewhere also found to be less costly, to include this work in the contract for street cleaning. The silt can then be taken out whenever the street is swept, and an overloading with rubbish and decomposition from the accumulation for weeks and even months will be almost impossible. Further, as it is undesirable in most instances to provide special means for the necessary ingress and egress of air, corresponding with the changes of water level in the sewers, otherwise than by perforating manhole covers, which method has been adopted almost everywhere as being the best, the only way to avoid the escape of obnoxious odors is to keep the sewers well cleaned and flushed. In New York the pipe-sewers should be flushed with Croton water, the larger sewers with penned up sewage. The statistics that have been compiled as to the manner and cost of cleaning in this and other cities clearly show the advantages accruing from closer attention to this matter, both in the resulting improved conditions of the sewers and in economy.

For obvious reasons it is far less difficult to secure a good maintenance in smaller cities than in large ones. Yet there is no reasons why the latter cannot gradually acquire the same standard and have the same attention bestowed upon sewer-cleaning in our country, as has been found practicable in the largest cities of Europe. The difficulties in the way at present seem to be mainly in the existence of many old improperly-shaped sewers, in the absence of flushing appliances, and in a somewhat limited supply of Croton water.

Mr. HERING then advises that exhaust steam either be intercepted by a cooling-basin, or carried to the roof of houses, and not let into the sewers in a normal state. Steam is injurious to the sewer lining, prevents inspection and assists decomposition and a freer escape of sewer air into the street. In the slips the sewers should discharge at the head of the piers into the current.

In conclusion Mr. HERING says that it will require about 6 months more to properly arrange and present the matter already collected and to prepare a final report which will present in detail the general principles which should apply to the design and construction of the sewers of this city, including their economical sizes, least grades, etc. After the presentation of this report he advises that all the drainage districts be carefully gone over and designs made for their improvement and these carried out as funds may be available. He says that New York has the densest population of any city on the continent, and in consequence there are important problems of sanitation to be worked out which cannot find their place elsewhere, and for which the experience of no other locality will furnish the data needed. Among others, the amount of storm-water which a given rain-fall will deliver to the sewers of a district in a given time is a purely local matter dependent upon so many contingencies that it must be ascertained for itself, and it is so important both to the proper construction and maintenance of the sewers, that this should be known with some precision.

The Report of the Interstate Commerce Commission.

The second annual report of the Interstate Commerce Commission, advance sheets of which are at hand, should be carefully read by everyone engaged in the railway business of the country, in connection with either the management or ownership, and also by the very large class of people who consider themselves or the community aggrieved or injured by any iniquity in the conduct of railway transportation. The latter class, especially, need to be taught and made to comprehend the wholesome truths which the Commission lays down. The prevalent enmity toward all railway interests, now so strong a factor in business and politics, might then be diverted into an intelligent attempt to aid in the solution of the real railway problems, which demand the wisest statesmanship backed up by an enlightened public opinion for their proper solution. No attempt can here be made to present or review the Commission's discussion of opposing views nor the arguments pursued, and it is only proposed to give a brief summary under each head of the report, of the work the Commission has done and the conclusions it has reached.

WHAT CARRIERS ARE SUBJECT TO THE ACT.

The Commission is evidently disposed to the belief that all common carriers doing business on steam railway lines—municipal roads and private mining or lumber roads alone excepted are—or should be, subject to the provisions of the act. The point is especially made that this is necessary to the collection of complete and accurate statistics. It is also believed that an amendment to the law should be made to bring express companies definitely under its control.

ADMINISTRATIVE WORK OF THE COMMISSION.

The great majority of complaints have been made informally and have either been without the jurisdiction of the Commission or easily adjusted by correspondence. "In most cases where a complaint has appeared to be *prima facie* well founded, the carriers have shown a disposition to consider it in an accommodating spirit. In one case decided, the principle was laid down that carriers, in making rates can not arrange them from an exclusive regard to their own interest but must respect the interests of their patrons and subordinate their own interests to the rules of relative equality and justice prescribed by the act.

It is believed that false billing, false classification and false weighing are prevalent, and that the act should be amended to punish shippers who engage in these frauds.

The giving of interstate passes, except as allowed by the law, is thought to have almost wholly ceased with the exception of passes between points within the same State, given to influence interstate traffic, which the Commission holds is contrary to the law.

THE LONG AND SHORT HAUL PROVISION.

In the section north of the Potomac and Ohio rivers and east of the Missouri, this provision is generaliy observed. In theSouth and Southwest the adjustment of tariffs to the new condition proceeds slowly from the amount of water competition. It is recommended that common carriers by water be made subject to the provision of the law requiring publicity of rates, at least. The short haul rule has been put into effect on the transcontinental roads and has necessitated the adoption of a complete new system of tariffs.

FILING AND PUBLICATION OF TARIFFS.

This provision of the law has been enforced from the outset and its working has been excellent. It is believed, however, that an advantage will be gained by requiring the schedules to be uniform in style.

THE OPERATION OF THE LAW.

The Commission possesses no evidence showing that the general result has been otherwise than beneficial. In so far as the act operated to stop discriminations, it was demanded on grounds of public justice. But it is believed that this prohibition tended to benefit the revenues of the railways. The severe losses of the railway companies during the past year are ascribed to the strike, the over-construction of the previous year, and, most of all, the rate wars. The legal right of carriers to reduce their rates as low as they please is believed to be unquestionable.

RATES UNREASONABLY LOW.

"The statute in its requirement of reasonable and just rates, has had in view the protection of the public from extortion and from unfair discrimination. It does not assume that railroad companies will need protection against their rates being made unreasonably low, and it has not conferred upon the Commission any power to ordain an increase of rates which it can see are not remunerative. In general, therefore, railroad managers possess the power to destroy the interest not only of their roads but also of their own stockholders, if they will recklessly make rates that lead to bankruptcy."

"If it is important to the public that a railroad once constructed should be maintained, the ability to make charges that will render its maintenance possible is also of public importance.

"The chief evil has been that the stock speculators controlling the roads have stood before the public eye as representatives of the whole class of railroad managers, and the devious ways of a few have been looked upon as characteristic of all."

"A railroad company can have no right to carry grain or dressed meats at nominal rates, and at the same time maintain highly remunerative rates on other articles of corresponding value, bulk, and ease of carriage."

"Steadiness of rates is an object to be kept in view in the public interest."

"Very low rates may possibly be injurious to the public interest even when they are relatively just and steadily maintained. * * * It is always for the interest of the country that the capital invested in any great and necessary industry should be reasonably remunerative."

"Good service and unreasonably low rates are antagonistic ideas; if the latter are insisted upon, the former ought not to be expected."

UNITY OF RAILROAD INTERESTS.

It is reasonable to expect that the carriers of the country will so far as practicable make such mutual arrangements that the public shall be able to secure through tickets and through freight transportation. The difficulty of making such arrangements universal, lies in the lack of ready means for enforcing the contracts.

"When it is considered how vast is the number of transactions which every important road must have with others, some of which before they are concluded reach out to distant parts of the country * * * it must be evident that a means of indemnification sufficiently prompt and effectual would hardly be found in the right to bring a suit at law."

To provide that all carriers assume the responsibility desirable would require that a common authority be vested with power to make traffic arrangements, to fix and maintain rates, and compel the performance of mutual duties among the members. Something faintly resembling this has heretofore been done through the traffic associations. These formerly enforced their agreement by pooling, which is now forbidden.

"With pooling prohibited, the tendency among the railroads seems likely to be in the direction of consolidation as the only means of effectual protection against mutual jealousies and destructive rate wars."

"But anything equivalent to consolidation of all the roads of the country under a single head, or even those of a considerable section * * * * * could hardly be supposed possible, even if the parties were at liberty to form it at pleasure. * * * An arrangement of this sort would be so overshadowing, so powerful in its control over the business interests of the country, and so susceptible of being used for mischievous purposes in many ways that public policy could not for a moment sanction it, at least unless by statute it were held in close legal restraint, and under effectual public supervision and control."

"While the Commission is not at this time prepared to recommend general legislation towards the establishment and promotion of relations between the carriers that shall better subserve the public interest than those which are now common, it must, nevertheless look forward to the possibility of something of that nature becoming at some time imperative, unless a great improvement in the existing condition of things is voluntarily inaugurated."

EFFECT OF THE LAW UPON CITIES.

It was not at first clearly perceived by everyone that the law would tend to equalize the commercial advantages of the small local stations and the cities. Such, however, has been the case, and while many of the competitive centers have been surprised to find that the very favorable rates which they formerly received were no longer allowable, the equalization of rates is only just to the shippers of the smaller towns and removes one influence tending to build up the city at the expense of the country. This feature of the law's operation has furnished the ground for several complaints to the Commission. The rule to be followed is that just and equal rates should be allowed to have their natural effect under the influence of legitimate competition.

UNIFORM CLASSIFICATION.

The Commission affirm their belief in the principle that rates must be more or less based on what the traffic will bear. Their conclusions in reference to uniform classification are that it is desirable as fast as it can be accomplished without serious mischief. That there is gratifying progress toward it, which has been especially marked during the year. That so long as the carriers themselves are working towards it with reasonable diligence and good faith, it is better that they should be encouraged and stimulated to continue their efforts than that the work should be taken out of their hands. That the work should proceed deliberately, and carefully.

IMMIGRANT TRANSPORTATION.

After reviewing present abuses the Commission recommends:

"That some place of greater capacity than Castle Garden be provided for the reception of immigrants, located somewhere upon New York Harbor, an island being preferable to the mainland for the purpose."

"That all regular lines of interior transportation be allowed to have agents at the place so provided, who may sell tickets under regulations so prescribed to secure equal privileges to all and prevent abuses."

"That the payment of commissions for the routing of immigrants and for procuring the shipment of immigrants from foreign countries be declared illegal and made punishable."

"That the Commission be authorized to prescribe fares for the transportation of this class of passengers."

PAYMENT OF COMMISSIONS.

After a thorough discussion of the arguments for and against the practice of paying commissions, it is declared to be hurtful both to the railways and the public. Reports made to the Commission showed that 49 companies paid $1,078,128 in commissions during the year, of which $812,884 was paid by eight companies. Scalpers are indirectly condemned, and it is recommended that railway companies be required to redeem unused tickets, which furnish no excuse for the business of scalping.

CONCLUSIVE BILLS OF LADING.

The subject is thoroughly discussed, but no recommendation is made.

ANNUAL REPORTS.

After much labor and study, a uniform blank for annual reports has been adopted, and a uniform date, June 30, is recommended for closing the books and striking the balance of each company.

With regard to over capitalization the Commission say: "It is believed that cases are now comparatively rare in which the capital stock of our railroad companies, as the same now exists, was actually issued for cash to *bona fide* investors in the same."

Most of the carriers profess to be actually unable to state the amounts paid upon their capital stock, or the the manner for payment of the same.

No commendable plan has yet been suggested for estimating the actual value of the railroads, and practically no attempt has been made to determine it.

AMENDMENTS RECOMMENDED.

The amendments which Congress is urged to make are as follows: Stating whether express companies are or are not under jurisdiction of the Interstate law. Making the provision against sudden raising of rates applicable to joint rates as well as to others. Giving the Commission authority to bring about uniformity in the method of constructing and publishing rates.

The preceding were also urged in the last report. In addition it is recommended that the power to suddenly reduce rates without notice be abridged, and not less than three days public notice be required. Also that the shipper who is a party to false billing, false classification, etc., be made a party to the offence and punished accordingly. Also that various methods by which carriers have claimed exemption from the operation of the law be made inoperative. Also that all roads be required to enter into joint traffic arrangements with their connections and that the Commission have power to regulate these arrangements. Also that the facilities so afforded shall include the reasonable receiving, forwarding and delivering by every carrier at the request of any other common carrier of through traffic at through rates and fares. Also that carriers engaged in water transportation be put on the same footing as carriers by rail in regard to making, publishing and maintaining rates.

PUBLICATIONS RECEIVED.

The Stevens Indicator.—Oct. 15, 1888. This number of the periodical published by the Stevens Institute of Technology, Hoboken, N. J., contains papers on "A Steam Heating Plant," "The Iron Industry of the United States", "The Manufacture and Strength of Rope", "New Self Registering Instruments", "Waste Gas of Blast Furnaces as Fuel for Steam Boilers", "Efficiency of Vapor Engines", and "The Coffin Mean Pressure Planimeter".

School of Mines Quarterly.—November, 1888, Columbia College, New York.

This number contains the following papers: "Notes on Preliminary and Location Railroad Surveying in the West", W. NEWBROUGH; "Determination of Invert Sugar by Alkaline Copper Solutions", F. G. WEICHMANN; "The Institution in Architecture at the School of Mines", "Rosenbusch's Microscopic Physiography of the Massive Rocks", "A Brief Review of the Literature on the Ore Deposits", J. F. KEMP; "High Bridge, New York", C. D. STARR; "Geological Notes", Prof. J. S. NEWBERRY; "Conditions Affecting the Flow of Streams at the Upper Waters of the Mississippi and Vicinity; "The Field Work of the Survey for an Elevated Road over a Crowded Thoroughfare", A. Mc C. PARKER.

The Reclaiming of Raw Products, with recommendations for the utilization of spent matter in the manufacture of chemical fibre from wood, straw, cotton, jute, bagasse, sorghum, and other fibre producing materials. By PETER HOGAN, Consulting Engineer, Albany, N. Y. Pamphlet, 11 pp.

First Biennial Report of the Board of Railroad Commissioners of the State of Vermont, 5¾x9¼ ins. 412 pp. With map and cuts. The printers of this book have appropriated to themselves the space on the title page usually devoted to the publisher's name and address. We suppose, however, that the publishers are the Board of Railroad Commissioners, whose office is at Hartfort, Vt. The report will be reviewed at length in an early issue.

The Mining Manual for 1888. By WALTER R. SKINNER. ontaining full particulars of Mining Companies and of all those registered from June, 1887; together with a list of Mining Directors. Lond n, 4 Birchen Lan . E. C. Price 7s. 6d.; ost fre : 8s.

While this is an English publication, the list of some 900 mining companies c ntained in it gives the chief details of A erican operations as well. These details include lists of officers, sha e capital, location of mines and extracts fr m a prospectu usually, giving estimates of the value of the property.

Poor's Directory of Railway Officials, 1888. Third Annual Number. Containing lists of the officers of all railways in North America, and of the leading organizations auxiliary to the Railway System; lists of officers of South American and British railways, etc., 304 pp., 6 x 9½ ins., cloth bound, $2.00, Poor's Railroad Manual Co., 70 Wall St., New York City.

This book bids fair to become as indispensable a work of reference as the well known Manual. The new features of the present volume are a directory of the railways of Great Britain and Ireland and an additional list of railway contractors, arranged geographically by States. The list of the private lumber, logging and mining railways of the United States is also greatly improved by an arrangement by States and the use of full face type for the names of the roads. In fact the geographical arrangement has been carried all through the directories of the dealers in railway supplies, greatly increasing their convenience for reference. The directory of steam railway lines doing a general traffic business contains the officers of 899 different railway lines and the other lists in the book seem to be no less complete.

The Technic.—The Annual of the University of Michigan Engineering Society. Nov.4, '88. Ann Arbor, Mich.

The number for 1888 contains portraits of and notes on Prof.'s CHAS. E. GREENE and BYRON W. CHEEVER. Also the following papers: "Engineering Experiences", "Construction and Maintenance of Roads", "Cements", "Ventilation of Houses", "A Retaining Wall for Earth", "Long Distance Distribution of Electric Energy", "Dynamics of Reciprocating Engines", "Blue Printing." We may later give some of these more fully.

Subjects for Papers, Suggested by the Institution of Civil Engineers for 1888-89.

The Institution has sent out its annual list of suggestions for papers to be read and discussed during the sessions of 1888-89. For approved papers the Institution has the power to award prizes from the following funds bequeathed for this purpose: The TELFORD fund, producing $1,300 annually; the MANBY donation, $50; the MILLER fund, $750 per year, and the HOWARD bequest, $80 per annum.

The list suggested covers 52 different subjects, of which the principal may be given as follows:

(2) Standard specifications for the materials used in the construction of engineering works, (4) the construction, ventilation, and working of railway tunnels of great length (7) the value, with respect to the safety and durability of metallic bridges, of (*a*) increase in the weight of the structure, by the choice of other than the lightest design, and (*b*) increase in the dead load, by the adoption of a heavy description of flooring, with or without the addition of concrete or ballast, (13) description of mining machinery of improved design, (15) the physical properties of metals under tests, (16) the working strength of iron and steel as affected by (*a*) the amplitude, (*b*) the frequency, and (*c*) the time-rate of the stress-variations, (17) the present position of the manufacture of steel—its defects, and suggestions for its improvement, (18) the effect upon basic steel of (*a*) chromium, (*b*) aluminium, and (*c*) tungsten, (19) the properties of bronzes and other alloys (20) researches on the actual working limits of stress in machinery or structures under known condions of variations of loading, ((21) the corrosion of metal structures, and the best means of preserving them, (23) on forging by hydraulic pressure, and casting under the same, (24) the construction of the working parts of steam engines, in relation to the high pressures and temperatures now becoming general, (25) the practical limit to the working pressure of steam in marine boilers, (26) the various systems of forced draughts in boilers, with the economical results obtained, (29) on the highest speeds attained and attainable on railways, having reference to gradients, curves, and the locomotives employed, (30) the application of the compound principle to locomotive and to portable engines, (32) the petroleum engine and its applications, (33) the distribution of power by compressed air or by vacuum, and the construction of machines to be worked by compressed air or by vacuum, (39) the plant used in the execution of important engineering works, (40) tools used in the building of iron and steel ships, and in the construction of boilers, (43) the generation of alternating currents in dynamo-electric machines, and their utilization for lighting and power purposes, (44) electric meters for recording the consumption of electrical energy, (47) the application of electricity to the working of street tramways and of railways, (48) the application of electricity to the working of cranes, pumps, tools, etc., and, (49) the application of electricity to smelting and metallurgical operations.

SOCIETY PROCEEDINGS.

The American Society of Civil Engineers.—The regular monthly meeting was held Dec. 5, Vice-President J. J. R. CROES in the chair, and a large number of members present. A communication was read from the Institution of Civil Engineers (England) making enquiry as to the probable number of engineers who will visit England next year in connection with the international exhibition at Paris.

The Secretary announced the deaths of SAMUEL B. CUSHING, of Providence, R. I., elected a Member in June, 1887; and HENRY W. B. PHINNEY, of West Fall Brook, Cal., elected a Member in January, 1885.

A paper on "English and American Railways Compared in Operating Expenses," by EDWARD BATES DORSEY, M. Am. Soc. C. E., was read by the Secretary and discussed. Particular attention was called to the light loads and high speeds of English freight trains, and it was stated that on the New York Central there is a tendency to increase the speed of freight trains with cattle or perishable freight; this is the more easily done on account of the road having 4 tracks. The opinion was expressed that freight rates in the country are too low, as the revenue is in many cases too small to permit of the proper reconstruction of the track to meet the requirements of heavier trains and greater traffic. This paper we print on another page.

The following candidates were elected:

MEMBERS.

ALFRED CRAVEN, New Croton Aqueduct, Dobbs Ferry, N. Y.

GEORGE WILEY FREEMAN, Asst. Eng. in charge of river improvements, Fort Stevens, Ore.

WILLIAM EDWARD MCCLINTOCK, City Engineer, Chelsea, Mass.

NORMAN JAMES NICHOLS, Honda, U. S. Colombia.

HENRY WHITBECK POTTER, Chief Engineer for Bowes, Scott, Read, Campbell & Co., City of Mexico, Mexico.

EDWARD HERBERT STONE, in charge of the Construction Section of the office of the Director-General of Railways, Simla-India.

SAMUEL C. WEISKOPF, Pittsburg, Pa.

ASSOCIATE.

JOHN CRESSON TRAUTWINE, Philadelphia, Pa.

JUNIORS.

THOMAS WARREN ALLEN, New York.

MARK FARGUSSON, Brooklyn, N. Y.

JOHN MOYER FARLEY, Albany, N. Y.

CHARLES FRANCIS WOOD, New Haven, Conn.

Engineers' Club of New York.—The following circular has been issued in regard to this proposed new social organization:

The incorporation of the Engineers' Club being completed, a meeting was held in the rooms of The American Society of Civil Engineers, 127 E. 23d Street, on the evening of Tuesday, Dec. 4, at which steps were taken to carry out the objects of the club. DAVID WILLIAMS, *Sec* 66 and 68 Duane St.

Engineers' Club of Kansas City, Mo.—At the meeting on Nov. 19. Dr. WELLINGTON ADAMS gave an address on "The Present Status of the Electric Railway Problem", being in part a discussion of the paper read by Mr. WYNNE at the last meeting. It was discussed by Messrs. KNIGHT, WYNNE and LAWLESS, the latter giving a review of a recent tour of inspection of the electric railway at Allegheny, Binghamton, Richmond and Harrisburg. KENNETH ALLEN, *Secretary.*

Arkansas Society of Engineers, Architects and Surveyors.—The second annual meeting was held at Little Rock, Ark., Nov. 22, 23 and 24. The following officers were elected: President, THEO. HARTMAN; Vice Presidents, A. B. MATSON, THOS. HARDING and B. S. WISE; Corresponding Secretary, F. J. H. RICKON; Recording Secretary, F. W. GIBB; Treasurer, J. H. HANEY.

The following papers were presented: "Fort Smith Sewerage System", J. P. BATES; "Municipal Improvement of Little Rock", G. P. C. RUMBOUGH; "Water-Works of Texarkana", A. B. MATSON; "Concrete in Construction", J. T. HOGANE; "Water-Works of Rogers, Ark.", J. M. WHITHAM; "Electric Lighting of Towns", W. E. ANDERSON; "Arkansas Timber", E. C. BUCHANAN; "What is Generally Expected of a Surveyor", W. E. KEEFER; "Descriptions in Deeds", B. S. WISE, and WM. MITCHELL: ""Construction of Hydraulic Rams", GEO. C. SCHOFF; "Uses of the Plane Table", D. C. B. AIKEN: "Highway Bridges", LEE TREADWELL.

New members were elected as follows: *Members*: J. M. CLEFF, County Surveyor of Grant Co.; I. W. HOLMES, County Surveyor of Dallas Co.; M. TRUEHEART, City Engineer of Pine Bluff; JOHN H. D'AILLE, and L. S. DUNSCOMB. *Associates*; Capt. W. U. SIMONS, U. S. Signal Service; J. M. BROWN and ALBERT COHEN.

CONSTRUCTION NEWS.

RAILROADS.

East of Chicago.

Existing Roads.

Lake Shore.—J. R. Ryan & Co., the contractors on this New Hampshire road, from Alton to Lake Village, 15 miles, have the grading about completed.

New York, Mahoning & Western.—A crossing war between employés of this company and the Cincinnati, Hamilton & Dayton occurred at Ottawa, O., Nov. 28. Several men were injured.——A Peoria, Ill., paper states that the company is negotiating to secure aid from that city in case the line is completed to Peoria.——A report from Findlay, O., states that the company has secured the backing of Fellows, Johnson & Co., of New York, and other prominent capitalists, so that it will have no further trouble from lack of funds.

Evansville & Richmond.—Another election is to be held at Columbus, Ind., to see if the city will vote $75,000 in aid of this road on condition that it passes through the city and builds a $6,000 depot and machine shops there.

Canadian Pacific.—Wabash officials deny the report that C. P. trains are all to enter Chicago over their line. ——On the Detroit extension about 5 miles of roadbed are ready for the rails.

Grand Trunk.—The company have decided to build a short spur into the town of Chatham, Ont. The move is made necessary by the new line of the Canadian Pacific which runs through the center of Chatham.

Lake Shore & Michigan Southern.—It is rumored that this company is trying to secure control of the Cleveland & Mahoning Valley Railway, which now forms part of the Erie system. Another report states that the company has secured an option on a controlling interest in the Cincinnati, Jackson & Mackinaw Railroad.

Poughkeepsie Bridge.—Only the finishing touches remain to be given to the structure and its approaches, and nearly 3,000 men are at work on the connecting railways east and west of the bridge.

Old Colony.—At the annual meeting in Boston, Nov. 27, the company was authorized to increase its capital stock from $12,000,000, to $15,000,000 and to build the proposed branch from North Attleborough to Walpole, Mass., the cost of which will be about $300,000.

Pennsylvania, Slatington & New England.—The formal Court decree has been issued terminating the receivership of this road and turning it over to the purchasers, W. W. GIBBS of Philadelphia and others.

South Mountain.—The property and franchises of this road were bought at Sheriff's sale at Lebanon, Pa., on Nov. 30, by JAS. MARCH of Lebanon and F. HANHAUSER of Philadelphia. The latter claimed to represent the Harrisburgh & New England syndicate, which proposes to complete a railroad from Slatington, Pa., to Poughkeepsie, N. Y.

Dayton, Ft. Wayne & Chicago.—The Dayton & Toledo railway from Dayton to Delphos, O., was widened to standard gauge on Nov. 29.

McKeesport & Belle Vernon.—On this new road up the Monongahela valley in southeastern Pennsylvania, trains are to be running from McKeesport to Elizabeth by Dec. 15.

Pennsylvania.—The East Brandywine & Waynesburg railway in Pennsylvania is to be extended from New Holland to a junction with the main line at Bird-in-Hand, a few miles east of Lancaster. Grading has begun.

Grafton & Upton.—This short Massachusetts road, on which tracklaying is nearly completed to West Upton, is to be extended to a connection with the New York & New England road in Milford, and surveys have been made.

New York Lake, Erie & Western.—The annual report shows gross earnings of $27,217,986, an increase, over 1887, of about $650,000. Operating expenses increased in a larger ratio, however, so that the net earnings, $6,829,350, are only $10,000 more than the previous year. The operation of the leased New York, Pennsylvania & Ohio system results in a loss of $343,911; and the report states that the terms of the lease must be modified. This feature of the report has given rise to the rumor that the Erie officials are planning to give up the Nypano and Chicago & Atlantic lines and devote their efforts to the development of the main line traffic between New York and Buffalo, and the coal traffic. During the year $625,000 was spent on equipment, but the cost of maintenance of way was reduced $485,000.

Western Maryland.—The annual report of this company shows gross earnings for the year of $771,210 and net earnings $290,684, a decrease of $12,093. On the 15 mile extension from the main line to the western terminus of the Baltimore & Harrisburg Railroad, five miles are graded and tracklaying is in progress. President HOOD

recommends its lease when completed, by the Western Maryland company at a rental of 5 per cent. on its cost. The line is expected to be open for traffic by June 1, 1889.

Marietta, Columbus & Northern.—The preliminary work is already under way on a 14 mile branch from Amesville to a point near Corning, on the Toledo & Ohio Central Railroad. One tunnel will be required on the extension, which will be driven this winter, and grading will begin as soon as spring opens.

Freehold & New York.—This short New Jersey road from Freehold to Keyport, N. J., is to be extended to Seabright. J. E. RALPH of Freehold is Superintendent.

New York & Ohio.—It is stated that the contract for building this road from Hudson, O., to Greenville, Pa., about 55 miles, has been let to J. D. LYLE of Columbus, Ind., and HORACE SCOTT, of Louisville, Ky. The rails have been purchased at Cleveland and a traffic contract has just been made with the Cleveland & Canton Railroad Co.

South Pennsylvania.—Trunk Line Commissioner ALBERT FINK was the principal witness at the recent hearing in the suit of the Pennsylvania Railroad Company to prevent the VANDERBILT heirs from selling their interest in the South Penn. to parties who wish to complete the road.

In regard to the question of competition between the Pennsylvania and South Pennsylvania, which is the point at issue, Mr. FINK stated that he did not think the South Pennsylvania competes with the existing company between its termini; that he believes it penetrates an altogether different territory, and that by common acceptation of railroad men the lines are not rivals. Under cross-examination he admitted that there was a certain competition; but that by arguing to extremes, almost any line could be said to compete in a certain sense with other lines.

The Pittsburg *Commercial Gazette* publishes the following interview with STEPHEN B. ELKINS:

"Yes, unfortunately, I am one of the minority stockholders in the South Penn. I belong to the Pittsburg crowd. The fellows that are tied up in a confusion of Gordian knots. But we can't even cut our way loose. There will be another meeting of the stockholders of that concern shortly with the usual results. We will then learn, as we have often done before, that the problem is about as far from solution as ever.

"The Pennsylvania railroad and the Vanderbilts have the entire say-so in this matter, and we have to merely watch, wait and pray. The Pittsburg end of that deal is badly rattled, and we would all like to get our money out of the concern and call it quits, but the big fellows won't let us even do that.

Rome, Watertown & Ogdensburg.—JOHN S. ROCKWELL, of Angelica, N. Y., is securing right of way for a railroad to run from Lincoln Park, just west of Rochester, N. Y., to Charlotte. He states that the move is in the interest of a syndicate who contemplate building a railway over the route named to connect the Rome, Watertown & Ogdensburg and the Buffalo, Rochester & Pittsburg. It is surmised that the Delaware, Lackawanna & Western is also interested in the enterprise and wishes to secure a shipping point on lake Ontario for its coal traffic.

Binghamton & Williamsport.—Ground was broken at Little Meadows, Pa., on Dec. 3, for this road.

Grand Southern Ry. of New Brunswick.—The balance of the money has been paid for this New Brunswick road, and it is stated that the purchasers will incorporate the Shore Line Ry. Co., which it is supposed will complete this road and the projected Maine Shore Line Railway. RUSSEL SAGE, GILES E. TAINTOR and others of New York, and JOHN MCMILLAN and HUGH MCLEAN of St. John are interested.

Niagara Central.—It is reported that this short road from Niagara Falls to Thorold, Ont., has been purchased by the Michigan Central and will be extended as originally projected, to Toronto.

New York, Central & Hudson River.—The annual report of this company shows as follows:

	1888.	1887.
Gross earnings	$36,132,920	$35,297,055
Operating expenses	24,626,338	22,388,623
Net earnings	$11,506,582	$12,908,432
Fixed charges	7,832,464	7,760,924
Profit	$3,675,118	$5,147,508
Dividend	3,571,132	3,577,132
Surplus	$97,986	$1,570,376

The gross earnings are the largest in the history of the company.

New York & Massachusetts.—Civil Engineers FOWLER and ROOT are busy surveying for the contemplated new railroad westward to the Hudson river, which is to connect with the Central Massachusetts at Chicopee or Holyoke, opening a new line direct to the coal fields. Their work is being done this side of the Sandisfield range of mountains, and they have found traces of the surveys made 50 years ago for the Boston and Albany road when it was planned to run that line south of its present location. Another set of engineers are surveying from Sandisfield westward. The country is very mountainous and the grade of the proposed road will be comparatively steep in going from the Connecticut river to the Housatonic valley, but not more so than that of the Connecticut Western line a few miles south.—*Springfield Republican.*

Pittsburg & Lake Erie.—The annual meeting of this company is to be held at Pittsburg on Jan. 22. It is expected that the capital stock and bonded indebtedness will be increased. It is thought that in the near future the line will be double tracked for its entire length. The double track at present extends from Pittsburg to Chartiers and from Youngstown to Lowellville. About 40 miles remain to be double tracked.

New Projects and Surveys

Tilly Foster Mine.—Incorporated in New York to build a railroad two miles in length in Putnam county, by PERCY R. PYNE, EDWIN F. HATFIELD, WM. E. DODGE Jr., and others of New York.

Scranton & Forest City.—It is reported that the Central Railroad of New Jersey is backing this new Pennsylvania scheme. The road will give the Central a connection with the Jefferson branch of the New York, Lake Erie & Western. Work is to begin in the Spring.

Sault Ste. Marie & St. Ignace.—Chief Engineer GEO. COX, of Sault Ste Marie, is to make surveys this winter to find a more direct route for this proposed road in the north Michigan peninsula.

Marquette City & Presque Isle.—Surveys are in progress for this short Michigan road. TIMOTHY NESTER is President and FRED HEFFERMAN is Secretary.

Cornwall Branch.—The citizens of Cornwall, Ont., are anxious to secure a branch from the Canadian Pacific to their city, the estimated cost of which is between $350,000 and $400,000. Asst. General Manager THOS. G. SHAUGHNESSY has offered on behalf of the company to lease the line at a rental of 40 per cent. of the net earnings if the city will build it. The city will endeavor to secure a bonus in aid of the road from the Government.

West Chester & Lenape.—The Board of Trade of West Chester, Pa., have voted to have a survey made for a railroad from West Chester to Lenape, on the Wilmington & Northern, about 4 miles. The survey will probably be made by Chief Engineer F. L. HILLS of the Wilmington & Northern.

SOUTHERN.

Existing Roads.

Atlantic, Gulf & Havana.—Chief Engineer D. D ROGERS of Daytona, Fla., informs us that this company has purchased the graded right of way of the St. Augustine & South Coast railway, from St. Augustine south, 8 miles, and proposes to build a railway from St. Augustine *via* Daytona and DeLand to Tampa Bay on the west coast of Florida, 170 miles. Preliminary surveys have been made from the end of grade to the crossing of the St. Johns river near DeLand, and most of the right of way is obtained to Daytona. The line will be located with maximum curves of 5° and grades of 1 per cent. There will be two drawbridges, one over the St. Johns river and another quite small. The road is expected to secure a good traffic in small fruits, lumber, etc., and will be a favorite route for winter tourists. The company is wholly independent and its capital stock has all been taken, principally by Philadelphia parties. JOHN D. STETSON of Philadelphia, is President. It is expected to let contracts within two months and have the whole line ready to open for traffic inside of a year.

West Virginia, Central & Pittsburg.—The Elk Garden branch, 7 miles in length, which leaves the main line at Harrison, about 2½ miles above Blaine, W. Va., has just been opened for traffic. It reaches four productive coal mines.——An important meeting of the directors of this company was held at Pittsburg on Nov. 27, to discuss a plan for securing a direct outlet to Pittsburg. It is proposed to extend the main line 25 miles and induce the Pennsylvania R.R. managers to build a 30 mile branch from Fair Chance, Pa., on the Pittsburg, Virginia & Charleston, southeast to connect with this line.

Southern & Western Air Line.—Grading on this North Carolina road, which is to run from Shelby to Cranberry, has reached Cleveland Mills. Tracklaying is to begin soon.

Tennessee & Ohio.—This road has been purchased by E. J. SANFORD of Knoxville, Tenn., who is having preliminary surveys made for the proposed extension, 40 miles in length, to Big Stone Gap.

Carolina, Knoxville & Western.—It is stated that the stockholders of the old Atlantic, Greenville & Western, which was consolidated with this company about a year ago, have taken steps to annul the consolidation and reorganize the old company. The line was nearly graded from Greenville, S. C., to Augusta, Ga., at the time of the consolidation, and nothing has been done since that time by the Carolina, Knoxville & Western toward completing the line, all work having been concentrated on the division between Greenville and Knoxville, Tenn.

Ohio Valley.—Surveys have already begun on the extension from Princeton to Hopkinsville, Ky., and it is proposed to push the grading upon it during the winter and have trains running by next May. It is believed that the extension will be pushed on south from Hopkinsville to Jackson, Tenn.

Knoxville Southern.—The contract for grading a division of 20 miles in McMinn county, Tenn., has been let to McDonald, Shea & Co.

Tennessee Midland.—We have received a pamphlet giving the history and present status of this company, with the specifications under which the line is being constructed and a description of the route, outlining its advantages and its prospects for securing traffic at the various towns which it touches. The company has 85 miles, from Memphis to Jackson, Tenn., in operation. The report continues "Fifty miles from Jackson to Midland City, on the Tennessee river are under construction, to be completed early in 1889. Most of the right of way has been secured and permanent location made on the 95 miles from Midland City to Nashville, which it is proposed to put under construction at an early date. Local aid to the amount of about $600,000 has been secured between Memphis and Nashville, payable as the railway is completed through the respective counties. Preliminary surveys have been made between Nashville, Knoxville, and the Virginia State line and some right of way and local aid obtained. It is proposed to make the permanent location east from Nashville, secure right of way and local aid, and put that part of the railway under construction at the earliest practicable date."

The report is accompanied by a map showing the line with its principal connections and the continuation of the line in the State of Virginia known as the Virginia Western. Negotiations are now in progress by which the latter company will secure the partly graded roadbed and right of way from Lexington, Va., south, belonging to the Shenandoah Valley division of the Baltimore & Ohio. The construction of this through line would be of great advantage to the Baltimore & Ohio.

Roanoke & Southern.—A meeting is to be held of the stockholders of this company on Dec. 15, to vote on the proposition to bond the road for $15,000 per mile.

Louisville Southern.—Surveys are finished on the two proposed routes for the Richmond, Nicholasville, Irvine & Beatyville extension, and a decision is to be made at once as to which route will be adopted. A large force will then begin work on the grading.

Louisville, St. Louis & Texas.—The first regular train over this road was run on Dec. 3 from Louisville to Owensboro, 112.8 miles. Between Louisville and West Point, 20.8 miles, the tracks of the Chesapeake, Ohio & Southwestern are used. The following appointments have been officially announced: JOHN H SAMPLE, Chief Engineer; J H. MCCRACKEN, General Freight and Passenger Agent and Auditor; A. M. MCCRACKEN, Acting Superintendent; F. J. FERRY, Master Mechanic; M. H. FULTON, Train Despatcher; E. B. HITCHCOCK, Roadmaster between Stephensport and Owensboro; H. M. MCCRACKEN, Roadmaster between Stephensport and West Point.

Richmond & West Point Terminal.—It is thought that one of the first projects undertaken by this company will be extensions into the territory of the Norfolk & Western's profitable coal territory.——The Georgia Pacific stockholders held their annual meeting at Birmingham, Ala., Nov. 28, and approved the lease to the Richmond & Danville. The total mileage of the the road constructed and in operation is 377 miles. The gap between Columbus and Johnsonville, Miss., 141 miles, is under construction. About 100 miles are graded and 30 miles of track are laid. The Woodlawn & Bessemer branch and belt line at Bessemer have been completed during the year.

New Projects and Surveys.

Mt. Pleasant, Santee & Little River.—Surveys have begun on this road, which is to run from Mt. Pleasant, near Charleston, S. C., to Conway. The line is projected to develop a fertile agricultural region containing about one million acres of land now assessed at less than one dollar per acre for lack of drainage and facilities for trausportation.' It is desired to secure Northern capital to build the road.

Alabama Belt Line.—A charter has been filed for this company, to operate a railway from Attala *via* Gadsden, Anniston, Sylacauga, Shelby, Calera, Brierfield and Blocton to Woodstock. The Montgomery *Advertiser* stated that the charter has been procured by parties who wish to consolidate the Anniston & Gadsden and the Anniston & Atlantic Railroads and extend the line to the Blocton coal fields.

Stokes Bridge & Lake City.—A bill will be introduced in the South Carolina legislature to build a railway between the points named.

Charlotte & Georgetown.—On Jan. 10 Mecklenburg Co., N. C., will vote on the proposition to subscribe $50,000 to this company, a like amount to the Roanoke & Southern, and $100,000 to the Great Western Air Line Railroad Co.

Charleston, Chester, Gaffney City & Western.—The projectors of this enterprise are soliciting aid from the citizens of Gaffney City, S. C.

Birmingham, Mobile & Navy Cove.—THADDEUS MCNULTA, General Manager of this enterprise, has gone abroad, it is supposed to secure capital for building the road. The line is to be built from Mobile to Mobile Point, about 30 miles, giving an outlet to deep water.

Chicago & Indiana Coal.—During the present year the company in connection with the Chicago & Eastern Illinois, which it controls, has laid track on a connection between the two main lines from Goodland, Ind., to Momence, Ill., 34 miles in length, and has completed over 40 miles of double tracking from Momence north. The

company is carrying a heavy coal traffic from the Indiana mines to Chicago.

Winona & Southwestern.—At a meeting of the directors of this company on Nov. 28, several proposals for the tunnels were considered but none were adopted. Estimates are to be prepared by Chief Engineer WHEELER, of the cost of the extension to Le Roy by each of 5 different routes. The question of bridging the Mississippi river was brought up on the basis of the recent conference between Mr. HARRIS, of the Burlington & Northern, Mr. CAMPBELL, of the Green Bay & Winona, and Mr. M. G. NORTON, of the Winona & Southwestern. It was stated that both the two former companies are anxious to have the bridge built at the earliest possible date, and they are desirous that the Winona & Southwestern Co. should do it; but in case the latter is not ready to undertake the project, and should desire the Burlington & Northern Co. to undertake it, the last named corporation is able and willing to build the bridge. The matter was left for the three companies interested to formulate and submit a plan of operation. In the meantime the Winona & Southwestern Co. is taking the necessary steps for the appointment of a commission of engineers by the Secretary of War for the location of the bridge.

Chicago, Burlington & Quincy.— One of the prominent officers of this company states that the directors have consented to make a tentative move in the direction of extending the Alliance branch of the Burlington & Missouri River toward the coal mines in Wyoming. A contract has been let for $300,000 worth of work, to be stopped at any time on ten days' notice. If the State Board of Transportation puts in force its threatened reduction in rates, work will be stopped immediately.—— The people of O'Neill, Holt county, 180 miles northwest of Omaha, sent a delegation to try and induce the extension of a branch to that place; but General Manager HOLDREDGE told them "it was a wrong time to agitate anything of that nature." He attributed the stoppage of railway construction throughout the State to the action of the Board of Transportation in reducing rates.

Chicago, St. Paul, Minneapolis & Omaha.—A test of the new Missouri River bridge at Sioux City was made on Nov. 26 and proved in every way satisfactory.

Chicago, Milwaukee & St. Paul.— It is reported that the trip of President ROSWELL MILLER to London is for the purpose of explaining personally to the foreign stockholders of the company the conditions which have brought about such a reduction of income, and to induce them to support the management in its endeavor to bring the road back to a paying basis.

THE NORTHWEST.

Existing Roads.

Eastern Minnesota.—It is reported that the company has made surveys for shortening its line between Duluth and the Twin Cities and will begin grading upon it as soon as spring opens. The line will run from Pokegama station, near Hinckley, south to Coon Creek on the St. Paul, Minneapolis & Manitoba, where connections will be made for St. Paul. About 55 miles of new line will be required. The present distance from St. Paul to Lake Superior is 176 miles *via* the Manitoba and Eastern Minnesota lines, and 152 miles *via* the St. Paul & Duluth.

Atchison, Topeka & Santa Fé.—It is announced that the capital stock of the Atchison, Topeka & Santa Fé company, which owns the Chicago terminals of the Santa Fé system, has been reduced from $10,000,000 to $5,000,000 and that the capital stock of the Chicago Santa Fé & California has been reduced from $30,000,000 to $15,000,000. It is so seldom that we hear of a company *reducing* their capital stock, that this seems worthy of mention.

Deadwood Central.—The hands employed on the grading of this Dakota road went on a strike on Nov. 28, on account of a dispute over the rate of wages. The strike was soon settled and the men returned to work.

St. Louis, Alton & Terre Haute.—The completion of the Chicago, St. Louis & Paducah extension to Paducah, Ky., was celebrated by an excursion over the road on Nov. 30, of the principal officers of the company. The line was formally opened for traffic on Dec. 3. The Ohio river is crossed to reach Paducah by a new transfer boat, named in honor of Vice President and General Manager, GEO. W. PARKER.

New Projects and Surveys.

St. Louis, Quincy, Omaha & Sioux City.—This company has been chartered in Iowa to build a railway from St. Louis, Mo., *via* Quincy to Council Bluffs and Sioux City, Ia. F. R. STEARNS of New York City; T. A. SCOTT, W. HARRISON, J. C. RICHARDSON, and JOSIAH FOGG, of St. Louis; J. M. BISHOP of Quincy, Ill., and Jas. F. PEAVEY of Sioux City are among the incorporators.

Port Arthur, Duluth & Western.—At a public meeting at Port Arthur, Ont., it was resolved to ask the Ontario Government for a substantial bonus for 50 miles from Port Arthur to Sand Lake. THOS. MARKS of Port Arthur is President. $40,000 has already been spent on the road.

Calgary & Montana.—A surveying corps under charge of W. D. HARCLAY has just begun a survey from Fort Benton, Montana, to Lethbridge, N. W. T. This is the project in which A. T. GALT, Manager of the Northwestern Coal & Navigation Company, is interested.

THE SOUTHWEST.

Existing Roads.

White & Black River Valley.—At the Directors' meeting held at Newport, Ark., Dec. 1, JAS. P. COFFIN, was elected President, W. L. MCDONALD, Secretary and Treasury, and M. F. COLLIER, Attorney. It was voted to consolidate the company with the Batesville & Brinkley Co. The line is to extend from Jacksonport, Ark., to Black Rock, on the Kansas City, Memphis & Birmingham Railroad and thence to the Missouri State line. Construction is to begin in early spring.

St. Louis, Arkansas & Texas.—Tracklaying on the Malden extension was completed to Delta, Mo., on Nov 27.

Louisville, New Orleans & Texas.—A preliminary survey has just been completed for a branch from Wilson to Clinton, La.

Natchitoches.—W. A. JACK is trying to secure funds in New Orleans to extend the line to Hope, Ark.

Cape Girardeau Southwestern.—Tracklaying was completed to Williamsville, on the St. Louis, Iron Mountain & Southern, on Dec. 1. The extension to Hunter, the Current River Railroad terminus, will be finished by Feb. 1.

Atchison, Topeka & Santa Fe.—The company's telegraph system has been leased to the Western Union Telegraph Co., under conditions which make it practically a sale. Reduction of expenses is being effected all over the systems. Train collectors have been abolished and wages are being reduced wherever possible. The stock of the company has taken another tumble the present week having been sold as low as 52, while a year and a half ago it reached 120.

Texas & Pacific.—An order for general retrenchment in expenses went into effect Dec. 1.——It is stated that the company is contemplating the construction of a branch line from Abilene to San Angelo, Tex., about 100 miles. Also that work will soon begin on the proposed loop leaving the main line at Provencal, La., and joining it again at a point about 12 miles from Alexandria.

Ft. Worth & Rio Grande.—An amended charter has been filed for this Texas company under which the line is to be extended southwest to a connection with the San Antonio & Aransas Pass at Kerrville.

New Projects and Surveys.

Texas & Northwestern.—This company has been chartered to build a railway from Dallas, Tex., *via* Ft. Worth to a point on the State line in the direction of Albuquerque, N. M., with a branch toward White Oaks, N. M. Headquarters, Ft. Worth. Incorporators, J. P. MOORE and W. H. H. LAWRENCE, Ft. Worth; H. LEE SELLERS, Galveston; S. O. SMITH, Kansas City; E. MORSE, Rutland, Vt., and O. W. MOORE, Platteville, Wis.

Monroe & Bastrop. — F. P. STUBBS of Monroe, La., is securing stock subscriptions to build a railway to Bastrop.

Ft. Smith & El Paso.—This company, whose headquarters are at Ft. Smith, Ark., has decided to have Chief Engineer G. F. HIGGINS begin preliminary surveys.

New Orleans Belt.—A conference committee from the various commercial and trade organizations of New Orleans has decided on a route and plans for the proposed belt railway. The line would be built at the joint expense of all railways now centering at New Orleans, and would be owned and managed to advance their common interests.

General Manager E. T. JEFFERY of the Illinois Central addressed the Mayor and City Council on Dec. 1, pointing out the need of a belt railroad, bridge, and better wharfage facilities, if the city would reach the commercial importance to which it is entitled by its geographical position.

ROCKY MOUNTAIN & PACIFIC.

Existing Roads.

Seattle, Lake Shore & Eastern.—Officers of both this company and the Northern Pacific contradict the report that it is to be consolidated with the latter company.—— Work stopped for the winter on Dec. 1 on the eastern division, at a point 45 miles west of Spokane. Work will be pushed next season to the mouth of the Wenatchee river, and on the western division from Snohomish to Cody pass. A 2,500 ft. tunnel will be built in 1890 at an elevation of 3,400 ft., which though higher than the Northern Pacific's Stampede tunnel, will be reached by easier grades. In the fall of 1890 the line will be extended from the tunnel to the mouth of the Wenatchee river, completing the line.

Kansas City, El Paso & Mexican.—The first 10 miles of track on this road from El Paso, Tex., northeast, was finished Nov. 30.

Mexican International.—The surveying corps locating a branch to Monterey has been called in, as satisfactory arrangements have been closed with the Mexican National for hauling the construction material for the Monterey & Tampico railway.

Atlantic & Pacific.—A new line is to be built at The Needles, Cal., to obtain a new crossing of the Colorado river; and Contractor L. A. GRANT has already begun work. The new bridge will be 70 ft. above the water and built of iron. About 14 miles of new road will be required and the total cost is set at $350,000.

Oregon Pacific.—In the suit of Contractor G. W. HUNT against this company, a compromise has been reached by which the company pays the plantiff $60,000. The company is also endeavoring to settle the suit brought against it by NELSON BENNETT.

Southern Pacific.—The Stockton & Tulare extension has finally been completed to Poso, where it joins the main line.——There is no prospect that the West Side & Mendocino railway will be extended into Eureka county. When a line is built in that direction, it will be from Lake county. No definite plans have yet been made for the Carquinez bridge enterprise.

Bellingham Bay & British Columbia.—This Washington Territory road will be extended next spring to the Nooksack river coal mines and easterly through the Cascade Mountains.

Oregon Railway & Navigation Company.—The suit brought last summer by BRAYTON IVES and other stockholders of this company to prevent the present managers of this company from building branch lines in Washington and Ida o territories has been decided in favor of the plaintiffs and a permanent injunction has been granted obliging all work on these lines to cease forthwith. Whether the opposing faction will be able to carry out their plans and complete the lines which they already have well under way, remains to be seen. The w rk on the line beyond the Cœur d' Alene reservation had already been stopped for the winter. Surveys were in progress at last reports for a line from Lewiston to Camas Prairie. An important feature of Judge PATTERSON'S decision was the ruling that a contract by which competing companies agreed to refrain from building into each other's territory was not illegal on grounds of public policy.

Los Angeles & Pacific.—This road is to be extended from Burbank to Pasadena, Cal.

New Projects and Surveys.

Billings, Hot Springs & Gulf.—It is stated that a company has been formed with this ambitious title to build a railway from Billings, Montana, to Hot Springs, Ark., and thence to the Gulf. The general offices are to be at Billings, and the financial offices under direction of L. WESLEY FROST, at 146 Broadway, New York City.

Mexican Pacific.—This company has secured a subscription of $2,500,000 in London to its first preference stock. The lines to run from Port Tonala to a point on the Grijala river, making a line of inter-oceanic communication. Traffic contracts are said to be closed with the Mexican Southern and the Mexican Inter-oceanic companies.

Los Angeles & Eastern.—This California projected line is to run from Los Angeles north, it is supposed to connect with the proposed southern extension of the Union Pacific system. THOS. J. RUSK of Los Angeles, Chief Engineer, has already made surveys from Los Angeles north to the country line. Other projectors are W. B. BROWN of Concordia, Kan., and J. MARION BROOKS of Los Angeles. ——The Los Angeles *Tribune* quotes one of the projectors of the enterprise as saying: "We will pursue a northerly course until we cross the Atlantic & Pacific, then we turn east. Neither the Southern Pacific, the Santa Fé, or the Union Pacific have the slightest thing in the world to do with our company. We are backed by a big eastern company the name of which will surprise every railroad man in the country when it is made known. About $14,000 has been spent already in preliminary surveys."

Los Angeles, Utah & Atlantic.—This company, whose incorporation was noted in our issue of Nov. 17, has presented a petition to the Los Angeles City Council asking right of way for an entrance to the city, and it is stated has surveyors already in the field. The company has an option on the Los Angeles & Ocean road and has purchased the road from Raymond to Altadena. J. M. C. MARBLE of Van Wert, O., is President, L. R. WINANS, Vice President, CLARENCE W. SCOTT, of Los Angeles, Secretary. The office of the company is now at 51 North Spring St., Los Angeles.

Puyallup Valley.—Surveys are in progress on this Washington Territory road, and it is expected to reach Tacoma by Dec. 15.

Bellingham Bay.—Contractor NELSON BENNETT, has agreed to build a railway from Fairhaven to the Skagit coal and iron mines by Jan. 1, 1890, in consideration of a bonus of land valued at $160,000 given by the citizens.

FOREIGN.

Brazil.—REMI POULIN, of Ottawa, Ont., has just returned from Brazil where he has been making surveys for an extensive system of railway lines which are being promoted by a syndicate of Canadian capitalists headed by Ex-Mayor ABBOTT of Montreal.

Spain.—The Sierra Alhamilla Railway Company has been chartered in the State of New York to build a railway from the Port of Almeria, Spain, to mines in the province of Sierra Almahilla. The capital stock of the company is $1,000,000 and the directors are ROBERT L. S. HALL, CHAS. O. MILLER, LENOX SMITH, STEPHEN W. DOUBLEDAY, and EDWIN N. HILL of New York.

San Domingo Central.—

At the annual meeting in New York, Gen. HORATIO C. KING was re-elected President, H. L. BEAN First Vice-

President, GEORGE G. WARD Second Vice-President, JAMES E. COLEMAN Secretary, and Philip P. HARRIS, Treasurer. The board refused to renew the contract with W. H. BELL for the construction of the road, and has commenced the construction on its own account. The road is 156 miles in length and crosses the island from the port of Manzanilla to the Bay of Neyba, traversing a region rich in valuable woods for manufacturing purposes, salt and tropical fruits.

Proposals Open.

Bridge.—Substructure for bridge across the Gowanus canal at Carroll St. Plans and specifications on file. JOHN P. ADAMS, Commissioner of City Works, Brooklyn, N. Y. December 10.

Stone.—About 1,400 toises of unbroken 'banc-rouge' stone. PERCIVAL W. ST. GEORGE, City Surveyor, Montreal, Canada. December 12.

Pier.—Repairing pier No. 2, East river. THE DOCKS COMMISSIONERS, Pier A, North river, New York City. December 12.

Water Works.—Complete system at Fort Robinson, Neb. WM. B. HUGHES, Omaha, Neb. December 13.

Street Work and Sewers.—Regulating, granite block paving and sewers. THE COMMISSIONER OF PUBLIC WORKS, 31 Chambers St., New York City. December 13.

Water-Works.—Findlay, O. Impounding reservoir and improvement of Blanchard river. The work on the reservoir consists of excavation and embankment, trimming and puddling the lower slopes, constructing and rolling a graveled roadway on the terrace, trimming the upper slopes, dressing with selected top soil, and sowing with grass seed. The work on the river improvement consists of excavation and trimming, and dressing with a rip-rap of broken stone; and other work, as set forth in the specifications. Proposals will be received for either or both of above details. JOHN W. HILL, Consulting Engineer, Cincinnati. THE TRUSTEES OF WATER-WORKS, Findlay, O. December 14.

Gas.—Furnishing gas for lighting the public markets, armories, buildings and offices, or any of them, for the year 1889. THE COMMISSIONER OF PUBLIC WORKS, 31 Chambers St., New York City. December 14.

River Improvement.—Improving the channel of Seneca river and the Old Bear race, at Waterloo, N. Y. JAMES SHANAHAN, Superintendent of Public Works, Albany, N. Y. December 14.

Water Works.—Plans and specifications on file. FRANK KREYBILL, Chairman of Water-Works Committee, Las Animas, Bent Co., Col. December 17.

Viaduct.—Hawk St. viaduct. Plans and specifications on file. JOSEPH P. MORROW, Secretary, Hawk St. Viaduct Commissioners, Albany, N. Y. December 24.

Water-Works.—At Leetonia, O. About 5½ miles of 4 to 10-in. pipe, 55 hydrants, 60 gates, 60 gate boxes, pumping plant with a daily capacity of 1,500,000 galls., pump house, pump house, pump well, reservoir. Engineer, J. B. STRAWN, C. E., Salem, O. J. S. GREENMYER, Mayor, Leetonia, O. December 29.

GOVERNMENT WORK.

Breakwater.—Construction of about 600 lin. ft. of the east breakwater at Cleveland. Major L. COOPER OVERMAN, U. S. Engineer Office, Cleveland, O. December 17.

Excavating.—Excavating a channel between Assawoman bay and Indian River bay, Delaware. WM. F. SMITH, U. S. Engineer Office, Wilmington, Del. December 18.

River Improvement.—Work in Napa river. Col. G. H. MENDELL, U. S. Engineer Office, San Francisco, Cal. December 18.

Gunpowder.—About 25,000 lbs. of standard gunpowder for small arms. Major JOHN A. KRESS, U. S. Arsenal, Benicia, Cal. December 20.

Harbor Work.—Work at harbors on the eastern shore of Lake Michigan. Charlevoix harbor, placing three cribs on stone foundation. Frankfort harbor; placing two cribs on pile foundation. Portage Lake harbor of refuge; dredging 60,000 cubic yards. Manistee harbor; placing two cribs on pile foundation. Pentwater harbor; 1. Placing one crib on pile foundation; 2, furnishing pine timber, iron, stone, and edgings. White River harbor; furnishing timber, drift bolts, stone and edgings. Muskegon harbor; 1, Placing five cribs on pile foundation; 2, furnishing pine timber and plank, Norway piles, drift bolts, stone, and edgings or brush. Grand Haven harbor; 1, Placing three cribs on pile foundation; 2, furnishing pine timber and plank, drift bolts, stone and edgings. Saugatuck harbor; furnishing timber and iron. South Haven harbor; placing one crib on pile foundation. Saint Joseph harbor; construction of pile wing wall. Michigan City, Ind., outer harbor; 1, completing breakwater pier; 2, building exterior breakwater. Lieut. Col. S. M. MANSFIELD, U. S. Engineer Office, Grand Rapids, Mich. December 22.

Adjustable Stern Dock.—Adjustable floating stern dock of timber; of sufficient size and capacity to operate upon a vessel with twin screws, having an extreme width of 64 ft. and a draught of 23 ft., the plans of which are on file. All timber to be of the most suitable kind, copper fastened; the parts that may be submerged being creosoted, with 14 lbs. dead oil to the cu. ft., and the dock to be sheathed with 22 and 24-ounce yellow metal to a distance of 1 ft. above the highest line to be submerged. The dock to have steam and hand pumps, gates, boiler, tanks, valves, winch and other necessary attachments, complete and ready for use, and to be delivered in this condition, after a satisfactory test, to the commanding officer of the Naval Station, Key West, Fla. All right to use patents or patented articles employed in this dock or its construction are to be included in the proposals. The plans and specifications accompanying the bids are to be full and clear, describing kinds and qualities of materials proposed to be used. Plans not favorably considered will be returned to the bidders if desired. JAMES FULTON, U. S. N., Paymaster General, Navy Department, Washington, D. C. December 22.

Machines and Tools.—For the navy yard at Mare Id., Cal. THE SECRETARY OF THE NAVY, Navy Department, Washington, D. C. December 27.

Dredging.—About 14,000 cu. yds. in Ticonderoga river, New York; about 14,000 cu. yds. from Otter Creek, Vermont, and depositing the dredged material on the sides of the cut, also 11,000 cu. yds. in the deep water of the lake (5¼ miles average haul) for the Otter creek work. Major M. B. ADAMS, U. S. Engineer Office, Burlington, Vt. December 29.

Lighthouse.—Lake Borgne lighthouse, Miss. Capt. W. L. FISK, U. S. Lighthouse Engineer (7th and 8th districts), New Orleans, La. January 2.

Pile, Stone, Etc.—Materials for use in improving the Mississippi river below St. Louis. Piles, stone, manila rope, wire, nails, spikes and screw bolts. Major A. M. MILLER, U. S. Engineer Office, St, Louis, Mo. January 5.

Contracting.

Asphalt Works.—H. L. Cranford, of Washington, D. C., will at once rebuild his asphalt works which were burned recently. The loss was about $20,000.

Dry Dock.—The Detroit Dry Dock Co. has decided to establish a large dry dock and ship building yard at Duluth, Minn.

Water-Works.—*South Boston, Va.* Contracts are to be let Dec. 10. The supply is to be taken from the Dan river and pumped to a stand-pipe; it will be for fire and domestic purposes. Money has been appropriated to build the works. Population, 2,000. Chairman of Water-Works Board, W. D. BARBOUR; Engineer in charge of surveys, C. A. BALLOU.

Bridge Abutments.—The following proposals for the abutments of the West Main St. bridge at Rochester, N.Y., were opened Nov. 28, by JAMES SHANAHAN, State Superintendent of Public Works, Albany, N. Y.: Weider & McMahon, $8,378.20; James Robinson, $8,723.75; Charles Brown, of Mohawk, $9,607.75; B. P. Smith, of Rochester, $10,216; Wm. Fuller, $10,344.70; George Chambers, $11,252. The contract was awarded to Weider & McMahon.

Proposals for Bridge.—*Defiance, O.*—The Board of Commissioners of Defiance Co., O., will receive sealed proposals until noon, Dec. 13, for furnishing the necessary materials and building a bridge of iron or steel, with 2 stone abutments and 1 stone pier, where Hopkins St. crosses the Auglaize river. Plans, bills, descriptions and specifications for the abutments may be seen at the Auditor's office, and bids are invited for the materials and work of building the abutments. Bidders are also invited to make proposals on any other plan or plans for said work at the option of bidders, and are also invited to make proposals for furnishing the materials therefor and building the superstructure upon their own plans and specifications:

All proposals for superstructure shall be accompanied with plans and specifications, showing and setting forth the length of spans, the nature, quality and size of materials to be used in the erection; the strength of the structure when completed, and the separate costs of base and superstructure, when any proposal includes both; and, also, whether there is any patent right on the proposed plans, or any part thereof. Said bridge to be of 2 spans, one 177 ft. and one 207 ft. between masonry, and must have a roadway 20 ft. wide in the clear. Height of truss, not less than 28 ft.; capacity, 100 lbs. per sq. ft. of floor. Bidders are requested to make bids for superstructure with sidewalks 6 ft. in the clear; and also without the sidewalks. Also, bids on wood, steel, or iron joist. Bidders are invited to make their bids and proposals for furnishing all the materials, and performing all the works aforesaid, or for such parts thereof as they may see proper. The contract or contracts for furnishing the materials, and for the erection of the bridge as a whole or in parts will be awarded on that day, (or at a time to which the Board shall adjourn the consideration of the same), to the person or persons, who, giving security as required by law, shall be the lowest and most responsible bidder or bidders thereof, considering price, plan, materials and methods of construction. The Board reserves the right to reject any and all bids offered. W. T. HILL, County Auditor, Defiance, O.

Government Work.—*Dredging.*—The following proposals for dredging in Wilmington harbor, were opened Nov. 24 by Major W. H. H. BENYAURD, U. S. Engineer Office, San Francisco, Cal.: Pacific Coast Dredging & Reclamation Co., 97 cts. per cu. yd.; Allexey W. Von Schmidt, $1.25.

Dams.—The following contracts for repairing old and building new rock and brush dams and shore protections in the Mississippi river, between the Des Moines rapids and the mouth of the Illinois river during 1889, have been awarded by Capt. E. H. RUFFNER, U. S. Engineer Office, Quincy, Ill.: Patterson Bros., Keokuk, Ia.; between Keokuk and La Grange; rock, $1.70 per cu. yd.; brush, 8 cts. per cu. yd.; total, $1.78 per cu. yd.; A. J. Whitney, Rock Island, Ill.; between La Grange and Hannibal, Mo.; rock, $1.29; brush, 50 cts.; total, $1.79; and operating Coal Bluff and barges below Hannibal, rock, $1.; brush, 60 cts.; total, $1.60. The other bidders were as follows: C. Massenger, Fountain City, Wis.; L. B. Dellicker, Parkersburg, W. Va.; N. V. Tucker, Parkersburg, W. Va.; J. P. Lusk, St. Louis, Mo.; S. J. Truax, Hastings, Minn.; A. G. Ames, Quincy, Ill.; M. F. Langdon, Quincy, Ill.; Z. Fielder, Hannibal, Mo.; A. Kirchner, Fountain City, Wis.; Jacob Richtman, Fountain City, Wis.; H. S. Brown, Quincy, Ill.; James Collins and P. Munday, Canton, Mo.; and H. S. & W. F. Hopkins, St. Louis, Mo.

Dredging and Rock Excavation.—The following proposals for rock excavation and dredging in the Niagara river were opened Nov. 24 by Capt. F. A. Mahan, U. S. Engineer Office, Buffalo, N. Y.: Hingston & Woods, Buffalo, N. Y.; 2,600 cu. yds. rock excavation, $11.50 per cu. yd., measured in the cut, $29,900; 50,000 cu. yds. dredging, 17 cts. per cu. yd., scow measurement, $8,500. John Hickler & Son, Sault Ste. Marie, Mich.; rock, $15, $39,000; dredging, 25 cts., $12,500. Edwin H. French, Toledo, O., dredging, 28 cts., $14,000.

Dredging and Pier Work.—The following proposals for extending the government pier at Ontonagon, Mich., were opened Nov. 22 by Major J. B. QUINN, U. S. Engineer Office, Duluth, Minn.: J. C. Morrison, Duluth, $56 per lin. ft. for substructure, $11.20 per lin. ft. for superstructure, $10,640 total. Chas. Berner, Green Bay, Wis., $60, $30, $13,000; Nelson C. Chapman, Minneapolis, Minn., $66.50, $16.60, $13,295. The contract was awarded to J. C. Morrison.——The following proposals for dredging and building piers at Grand Marais, Mich., were opened by Major QUINN Nov. 24: Building superstructure; Powell & Mitchell, Marquette, $24,928; Truman & Cooper, Manitowoc, Wis., $25,600; Hogen & English, Green Bay, Wis., $25,690; Nelson C. Chapman, Minneapolis, $26,012.50; M. H. Fitzpatrick, Duluth, $28,200. Chas. Berner, Green Bay, Wis., $31,000. The contract was awarded to Powell & Mitchell. Dredging; M. H. Fitzpatrick, Duluth, 19½ cts. per cu. yd.; Chas. S. Barker, Duluth, 20 cts.; Williams, Upham & Co., Duluth, 22 cts. The contract was awarded to M. H. Fitzpatrick and will amount to about $20,000. No more contracts will be let at this office for at least two months. Marquette's harbor improvements will cost about $25,000 and those of Ashland $80,000.

Rip Rap.—The Fruin-Bambrick Construction Co., of St. Louis, Mo., has the contract to furnish rip-rap for the reconstruction of the levee at Bolivar, Miss. The levee will be washed down to an angle similar to the St. Louis levee, and heavy willow mattresses or a netting of brush will be laid over it. This will extend far out into the river bottom. The rip-rap will be thrown off barges on to the brush. The weight of the stone will sink the brush and when sunk the rock will remain in the meshes of the brush, and thereby form a stationary and solid bottom. The brush work will be done by the Government, under the supervision of Capt. ROSELLE.

Metal Markets.—*Structural Iron.*—Prices are about as follows: in Philadelphia, 2.05c. @ 2.10c. for bridge plate; 2c. @ 2.10 c. for angles; 2.6c. @ 2.7c. for tees, and 3.3c. for beams and channels, iron or steel. Store prices are as follows in Chicago: angles, 2.35c. @ 2.50c.; tees, 2.60c. @ 2.70c., beams, 3.80c. Mill orders are taken at the following rates, f. o. b. Chicago: Angles, 2.15c. @ 2.20c.; universal plates, 2.25c. @ 2.30c.; tees, 2.55c. @ 2.65c.; beams and channels, 3.40c. New York prices are: sheared plates, 2c. @ 2.1c.; universal mill plates, 2.1c. @ 2.2c.; angles, 2.1c. @ 2.15c.; tees, 2.5c. @ 2.6c., channels and beams, 3.3c.

Steel Rails.—New York, $27 @ $28. Chicago, $29. Pittsburg, $28 @ $28.50. It is reported that the situation is not very clear in regard to steel rails, and some extremely low prices have been quoted recently; one order having been placed for $30.50 delivered at Omaha, Neb., equivalent to about $25 at Pittsburg. The losses caused by the low prices will probably cause an increase in price.

Railway Track Supplies.—Pittsburg, Pa.; spikes, $2.20, 30 days, delivered; splice bars, 1.85c. @ 1.90c.; track bolts, 2.85c. with square, and 2.95c with hexagon nuts. New York; spikes, $2.20 @ $2.25, delivered.

Old Material.—Pittsburg, Pa., No. 1 wrought scrap, $21, net ton; wrought turnings, $13 @ $14; car axles, $25.50 @ $26.50; cast scrap, $15.50 @ $16, gross ton; cast borings, $12 @ $13; old car wheels, $20. Open hearth scrap steel, $18.50 @ $19.25. Short pieces of steel rails at $18.58. Old rails; $23.25 @ $23.50 in New York; $25 @ $25.25 in Pittsburg.

Plate and Tank Iron.—Philadelphia, Pa. Quotations about as follows: ordinary plate and tank iron, 2.05c. @ 2.15c.; shell, 2.4c. @ 2.5c.; flange, 3.5c.; fire-box, 4c.; steel plates, tank and ship plate, 2.25c. @ 2.3c.; shell, 2.7c.; flange, 3c. @ 3¼c.; fire-box, 3¼c. @ 4¼c.—(Compiled from *Iron Age*, Dec. 6).

Supplies and Equipment.—H. H. MANSFIELD, 36 Pine St., New York, formerly with Barrows & Co., has gone into business as dealer in new and second-hand railway, mill and manufacturers' supplies.

Tanks.—The Chicasaw Refining Co., of Memphis, Tenn. wants estimates for the construction and erection of 6 tanks, according to specifications which may be obtained of J. W. ALLISON, Secretary.

Paving in Mexico.—The firm of Grant Bros. & Co., which is composed of Thomas W. Grant and Henry Weiderhold, of Shenandoah, Pa., Lewis Grant, of Pottsville, Pa., and Col. John R. Wynkoop, of Philadelphia, has a contract for 100,000 sq. yds. of paving in the city of Mexico.

Water-Works.—*Sprague, Wash. Ty.*—Proposals for the construction of water-works have been advertised for and were to have been opened Nov. 19, but Mr. W. B. LOTTMAN, City Clerk, writes us as follows in regard to the contract: "The contract to build water-works for the city of Sprague has not been let. Not having full plans and specifications, the city "fathers" must go over all of their work again. They will now call an election to vote to bond the city and secure complete plans so that I can comply with the request of the contractors to furnish plans, etc. I think by hammering away a while longer they will strike the key to the situation, and we will try next spring have a water system."

Asphalt Paving.—At Pittsburg, Pa., a meeting was held recently by property owners on Penn Ave. to consider the question of an improved paving. An estimate prepared by City Engineer BIGELOW showed that to pave the street with Ligonier block-stone would cost $98,903.75, including the resetting of curb and putting in crossings. To pave with asphalt the estimate was as follows: Resetting 11,900 ft. of curb, $2,975; 249,000 sq. yds. of asphalt pavement, $74,700; total cost, $77,675; total frontage of property 10,700 ft.; cost per ft., $7.25, or $2 less than the Ligonier block would cost. Mr. BIGELOW said that the city could pave with cobblestone for about half the cost of asphalt, but, if the property holders would put their names on paper agreeing to pay the cost, or $3.62½ per ft., the city would agree to pave the street with the asphalt.

Cement, Timber and Coal.—The following proposals were received recently by the Docks Commissioners, New York City: Portland cement; James Brand, $2.30 per bl.; E. Thiele, $2.34; Emil Lenz, $2.34; S. L. Merchant & Co., $2.35; E. W. Fisher, $2.42½; A. C. Babson, $2.45; Eckmeyer & Co., $2.75.——Yellow pine timber; South Brooklyn Sawmill Co., $45 per M.——Treenails, etc.; Wm. B. Ferguson & Son, $248 per M.——Coal; Ward & Olyphant, $4.30 and $5.50 per ton; David Duncan & Son, $4.30 and $5.75.

Well Drilling Plant and Traction Engine.—The Empire Well Auger Co., of Ithaca, N. Y., has issued a 40 page illustrated catalogue and price list of well drilling machinery, tools and supplies. Steam and horse-power plants, boilers and engines, pumps, walking beam rigs, etc., are described and illustrated. One of the most interesting engines described is a road locomotive or traction engine, which can also be used as a portable engine for operating a drilling plant. The engine is claimed to travel over ordinary country roads with a load of 3 to 5 tons at a speed about equal to that of a good team of horses.

Artesian Well.—The following proposals for boring an artesian well have been received by Major J. W. REILLY, U. S. A., Augusta, Ga.: Sparks & Allen, Dundee, Mich., $4.25 per ft. for 500 ft., $2.75 per ft. for all below. Enterprise Drilling Co., Pittsburg, Pa., $7 per ft. for 200 ft., $4 per ft. for next 800 ft.; $5 per ft. for next 500 ft.; F. W. Carter, St. Louis, Mo., $6 per ft.; Edward F. Joyce, St. Augustine, Fla., $6.55; Wm. D. Chapin, Brooklyn, N. Y., $6.75; Thomas Murphy, Milledgeville, Ga., $8; Daniel Dull, Brooklyn, N. Y., $9 per ft.

Cable Railway.—*Denver, Col.*—The Denver City Cable Railway Co. is issuing first mortgage 6 per cent. gold bonds, secured by the first and only mortgage of the Denver City Railway Co., a corporation now operating by horses, under a charter giving exclusive horse car rights, fifteen lines over 42 miles of track in Denver, a city of 100,000 people. The bonds are further secured by a first and only mortgage upon 9½ miles of double track cable road, with land, viaducts, machinery, etc., now being constructed by the Denver City Cable Railway Co., which latter company owns the horse car lines, and will operate the two systems in connection with each other.

Boilers.—The following proposals for water tube boilers for new steam heating plant at the Capitol have been received by EDWARD CLARK, architect of the Capitol, Washington, D. C.: Charles Ward, Charleston, W. Va.; 50 H. P., $1,000; 400 H. P., $7,200. Babcock & Wilcox Boiler Co., New York, 51 H. P., $1,244; 368 H. P., $6,928; 416 H. P., $7,754. National Water Tube Boiler Co., New Brunswick, N. J.; 50 H. P., $1,134; 400 H. P., $6,174; 400 H. P. in 2 batteries, $6,570; 350 H. P., $5,393; 350 H. P. in 2 batteries, $6,120. John L. Gill, Jr., Philadelphia, Pa.; 50 H. P., $1,100; 320 H. P., $5,250; 368 H. P., $6,200. Abendroth & Root Mfg. Co., New York; 51 H. P., $995; 350 H. P., $5,349; 420 H. P., $6,070. Hegeman & Caldwell, New York, 450 H. P., $7,665. E. J. Codd Co., Baltimore, Md.; all boilers, $5,750; with brickwork, $6,000.

WATER.

Mystic Sewerage.—The Water Board of Boston, Mass., with City Engineer JACKSON, and ALPHONSE FTELEY, have inspected the Mystic sewerage works in Winchester, recently erected for the purpose of purifying the sewage discharged by the Mystic Valley sewer which has been constructed about 11 years. Within the past few years a number of methods have been employed to see which was the best, and as a result a large house containing an engine and machinery and four large tanks has been built, and the sewage is subjected to treatment by chemical precipitation by a continuous method, and the results obtained are satisfactory.

Water Power of Niagara.—At Buffalo, N. Y., a company with a capital of $125,000 will be formed to provide for a reward of $100,000 to the inventor who shall devise the best means of utilizing the power of Niagara Falls. After the reward is paid, the remaining funds will be used in the payment of engineers. The company will, by virtue of the payment of the reward, acquire the sole right to the use of the power-applying device.

Helena, Mont.—The following were the bids received for supplying water to the city: Helena Water Co. (the Geo. F. Woolston company); to furnish the entire city for nine months, 145 hydrants at $7.50 per month each; pressure guaranteed sufficient at all times to obviate the necessity of fire engines. The company will extend its mains as ordered by the city and furnish each additional hydrant at $6 per month. The Helena (East Side) Water Co., to furnish 50 hydrants on principal thoroughfares at $60 each per annum. The bids were referred to committees. The committee on the first bid recommended that the bid be accepted, but a minority report recommended that the prices be $5 and $4; the committee on the second bid reported that the company had not sufficient pipe or hydrants for general fire protection, but had pipe and hydrants on some of the business streets which could be made available for fire purposes. After much discussion the majority report of the first committee was accepted, with an amendment that the number of hydrants be reduced from 145 to 100. Mr. Woolston woul not agree to this contract and withdrew his bid; he will continue to furnish the city with water at $95 per hydrant for 145 hydrants until Jan. 20, 1889, after which he will be governed by the decision of the company in Boston. The Woolston company has a direct pumping system and the East Side company a gravity system.

Sing Sing, N. Y.—One of the last acts of Gen. NEWTON, previous to his resignation of the office of Commissioner of Public Works of New York City, was to execute a contract with the Sing Sing Water Commissioners, giving to that village the right to take for the water-works now being built, a supply of water from the Quaker Bridge dam not to exceed 2,000,000 galls. per day at the rate of 5 cts. per 100 cu. ft., equivalent to 750 galls. This will apply to the village in perpetuity and takes effect on the completion of the Quaker Bridge dam. In the meantime the village will take its supply from Indian brook, which is sufficient to meet all present needs. It is estimated that 2,000,000 galls. a day will supply the wants of 40,000 people, allowing 50 galls. a day for each person. This rate is considered reasonable when it is known that New York pays the city of Yonkers 13 cts. per 100 cu. ft. for the annexed district.

A New Well Borer.—A patent hydraulic well boring machine, the inventor of GEO. W. DURBROW, was tested recently at the Southern Pacific works at Los Angeles, Cal., and worked satisfactorily. It is to be used for sinking artesian wells in the deserts south of the city.

Cedar Rapids, Ia.—The artesian wells at the water-works are completed and are yielding a flow of good water at the rate of 36,000,000 galls. per month. There are three 5-in. wells, two of them are 1,425 ft. deep and one 2,225 ft. deep. The cost was $15,000. The Cedar Rapids Water Co. has expended $30,000 this year in wells and pipe extensions. The new supply is very acceptable, as water was formerly taken from Cedar river and was often not fit for drinking. C. J. Fox is Superintendent.

Water-Works.—*Rhode Island.*—Providence. An ordinance has been passed authorizing the City Treasurer to hire the sum of $25,000 for water-works construction.——Wakefield. The Wakefield Water Co. has purchased the middle pond at Rocky Brook for a reservoir and is making considerable improvements to fit it for the purpose.

Connecticut.—Stonington. The Mystic Valley Water Co. has let water into the Stonington pipes. It is expected that the whole system will be in working order by Jan. 1.——Pittsfield. The Water Commissioners have published a notice that they will petition the next Legislature for permission to take water from West pond in the town of Washington, and from the Sackett brook in Pittsfield, and the Hutchinson and Roaring brooks. This is the first step toward the enlargement of the Pittsfield water supply, and if the petition is granted, the town will have a plentiful supply of water.

New York.—Davenport. There are no water-works yet, but they are contemplated.—Cattaraugus. A proposal to establish water-works was voted down in August, 1888. Population, 1,100. For information address FRANK S. OAKES.

New Jersey.—Hoboken. The Hackensack Water Co. is laying a second main, 24 ins. in diameter; it crosses along the line of the West Shore tunnel, and down the western slope of the Palisades, through Bischer Ave. and Bergenwood road, to the Hackensack river. The work will probably be completed next month, and is constructed for additional security of the company's supply. The company has recently engaged to supply Englewood and other adjacent villages with water. The completion of the new main will give the company a duplicate set of all its supply machinery, there being already a double set of pumps in use.——Jersey City. A citizens' committee has voted to ask the Board of Works to ascertain from the Corporation Counsel what legislation is necessary to enable the city to construct and maintain a pipe line to the head waters of the State, and furnish to the people pure water by gravity.

Ohio.—Bowling Green. Ferris & Halladay, of Jersey City, N. J., are at work on wells to ascertain if a suitable supply can be assured; construction will depend upon results.——Ashtabula. The Ashtabula Water Supply Co. has been incorporated by O. B. CLARK and others; capital stock, $250,000.——Glendale. There are no water-works. A test for water was made by the Bradford Well & Pump Co., of Cincinnati, but they failed to make a well.

Indiana.—Lowell. Water-works are needed. The Town Trustees are C. PETTEE, A. BRENNAN and H. HELSBERG.

Kentucky.—Richmond. The Richmond Water-Works Co. has let the contract for building its works to M. Philbin, of Chicago, the lowest bidder, at $76,144.44.——Russellville. The City Council has under consideration plans and specifications for a system of water-works for domestic supply and fire protection. A stock company is prepared to construct the works, if the council concludes not to undertake the work.

Michigan.—Alpena. The water-works are now supplying water from the bay.——Port Huron. A new water main is being laid across Black river at 10th St.——Grand Rapids. Since September 8 miles of pipe have been laid.——Greenville. The water-works system is nearly complete, with about 6 miles of mains laid and 45 hydrants. The pumps are two in number and are worked alternately every 24 hours. The steam is furnished by two tubular marine boilers which are so arranged that water is continually hot in the boiler not in use. The water is furnished from 30 wells, and a suction pipe connects with the river so that river water can be used in case of necessity.

Illinois.—Springfield. The new supply from the galleries is satisfactory; the 2,000,000 galls. pumped daily reduce the depth 1 ft., leaving 3 ft.; during the night the water rises in the galleries and rises 4 ft. in the well. The galleries will be extended in the spring to increase the supply for the summer.

Wisconsin.—West Superior. The water supplied by the city water-works has been unfit for use, except for washing purposes, and drinking water was being peddled by watermen, who pumped it from wells on Connor's Point, but the bay water is now passed through a filtering process and is gradually becoming fit for drinking purposes.

Minnesota.—Owatonna. Water-works are greatly needed, and at one time the city voted to issue bonds for the purpose. C. W. HADLEY is Chairman of the Park Committee.

Colorado.—Montrose. Work is progressing on the excavating and pipe laying; the works will be completed early next year.

Nebraska.—Plattsmouth. A new well is being sunk for the water-works, to furnish a supply of 350,000 galls. per 10 hours.

Oregon.—The Dalles. Water-works are to be built at a cost of $50,000; the city will issue bonds for the work.

Washington Territory.—Chehalis. The Chehalis Water Co. has been incorporated by JOHN DOBSON, JOHN W. PARR and W. T. FORREST, of Chehalis, and H. A. RAY, of San Francisco. Capital stock, $20,000.——Kent. The water rights and right of way from the hills to the village have been secured and a company will be incorporated at once to build the works.

Texas.—Marshall. The City Council has made a contract with E. Sutphin, to develop the water supply at Walnut creek, situated 3 miles north of town, the council to pay him $3,000, and work to be commenced by December 15. If the council then deems the water supply sufficient and of good quality, it agrees to allow Sutphin to put in a system of water-works at a price stated in a proposition previously submitted, in which event the $3,000 will be a part of the amount to be paid him for building the works.——Dallas. The reservoir will be completed by McRae & Lally.

Canada.—Montreal. A considerable amount of 6, 10 and 12-in. pipe is to be laid next year; the Council is to be asked for $112,000, the amount estimated for the materials without the cost of laying. The cost of laying is estimated at $75,000. The new Gilbert engine is working satisfactorily, also the new Worthington engine.——Stratford, Ont. The Stratford Water-Works Co. will build a stand-pipe 130 ft. high.

Water Supply for Ohio Towns.—A project for supplying water from Lake Erie to the inland cities of the State, is interesting the capitalists of Cleveland, O. They believe a pipe 500 miles long can be worked to advantage, and contemplate running a water pipe line to Columbus and thence to Cincinnati, using pumping engines to force the water through.

Santa Ana, Cal.—The $20,000 contract let by the Trustees to W. R. Coates includes everything in connection with the new water-works, and also includes the preparation of plans and estimates and the supervision of the work. He will excavate and line with brick a reservoir 25 ft. diameter and 25 ft. deep, and build an engine house in which will be a $5,000 pumping engine. The system will be direct pumping.

Burrillville, R. I.—The Burrillville Water Co. has made a proposition to the taxpayers of the Pascoag fire district to construct and operate a complete system of water-works for domestic, fire and manufacturing purposes. The supply to be by gravity from Wallum or Herring pond, or an equally good gravity source, or if a gravity system is found to be impracticable the system to be the combined direct pumping and pumping to stand-pipe. The company will lay a complete system of 4-in. to 12-in. cast-iron pipe and 100 hydrants, the hydrants to be non-freezing, with two or three nozzles. For $4,000 per annum for 30 years the company will supply water for 100 hydrants for fire purposes, for 2 public display fountains, and 6 watering troughs or drinking fountains, for filling reservoirs for fire purposes, for street sprinkling, and for all public buildings, school houses and religious and charitable organizations on the lines of pipe. After the works are completed, the Fire District is to have the right to purchase the property and plant of the water company. GEO. ALEXANDER is President of the company. The proposition will be considered Dec. 10.

Jersey City, N. J.—At a meeting of the Board of Public Works on Nov. 3, the water supply question was still further discussed, speeches being made in favor of and opposition to the award of a contract to the syndicate represented by JOHN R. BARTLETT. The Citizens' Committee has adopted the following resolution:

"*Resolved*, That we are unalterably opposed to Jersey City making any contract with any private water company for a supply of water in Jersey City, as such a contract might surrender our rights in the Passaic river, and place us under the worst of monopolies—a private water company. We are in favor of the reorganization of the State Board of Water Supply; that the control of the drinking water of the State be given to said Board, with a view that all the cities in the State of New Jersey may obtain in the future an abundant supply of good water.

Sewerage.—***Bristol, R. I.***—The report of the Sewerage Commission, made in September, has been published. The total cost of sewers, connections, etc., is estimated at $101,036.

Patchogue, N. Y.—The new sewerage system has been completed and the sewers flushed.

Savannah, Ga.—The city is contemplating the adoption of a sewerage system, which it is expected will be laid before spring and will cost the city not less than $150,000.

Anniston, Ala.—The Tyler Hill Land Co. will build sewers and streets over 34 acres of land.

Birmingham, Ala.—The town proposes to issue bonds for $300,000 for sewers.

Ashland, Wis.—The sewerage system has been completed.

Minneapolis, Minn.—Work has been resumed on the North Minneapolis sewer tunnel, under the charge of City Engineer RINKER. A shield and moveable bulkhead will be used at the working end.

Pittsburg, Kan.—KENNETH ALLEN and WYNKOOP KIERSTED, of Kansas City, Mo., are preparing plans for a system of small pipe sewers.

Armourdale, Kan.—The ordinance passed by the council for a system of sewerage to cost $54,000 has been repealed, the council deeming the system impracticable. The mayor and the council committee are making an investigation of the sewerage system now in use at Pullman, Ill., and Sioux City, Ia.

Helena, Mont.—The $150,000 sewerage bonds have been sold to Chas. H. Potter & Co., of Cleveland, O., at $1,525 premium.

Irrigation.—***Colorado.*** A company has been organized at Meeker to irrigate and develop the White River mesa, a tract of 10,000 or 12,000 acres.

Washington Territory.—The Kittitas Irrigation Canal Co. has been organized at Ellensburg to construct a canal 15 miles long. The work is to be completed by June.

California.—Near Bakersfield work is progressing on the reservoir and canals.——The people of Brown's Valley irrigation district have voted in favor of issuing bonds for $110,000.——At Susanville a storage reservoir for irrigating 40,000 acres of land has been established by M. LEAVITT and M. HUTCHINSON.——Near Fresno an irrigation district has been formed and a canal 25 ft. wide at the bottom will be dug: water will be taken from King's river.——The Highland canal, near Phœnix, has been completed and water turned into it. It is 22 miles long, 16 ft. wide and 2½ ft. deep, with a carrying capacity of 6,000 ins. of water. It will irrigate 16,000 acres in the Salt River valley.

Texas.—At Presidio the Poloo Irrigation & Mfg. Co. has been organized by S. J. HENSLEY, CHAS. HENDERSON and S. L. DE LEON; capital stock, $36,000.——A Canadian irrigation company has been organized by W. S. DECKER and others; New England parties are interested.——The El Paso Irrigation Co. has been organized at El Paso by S. W. RUSSELL, A. M. LOOMIS, A. BLACKER and others; capital stock, $250,000.

Arizona.—At Tucson a company has been formed, with WM. HART at its head, for the irrigation of a large tract of the Santa Cruz bottom, 20 miles south of the city. The water will be pumped from a well, connecting with a tunnel under the bed of the river.

Special Reports of Water-Works Construction.

THE ENGINEERING NEWS MANUAL OF AMERICAN WATER-WORKS is now being compiled, and will be *indispensable* to every manufacturer, engineer and contractor in any way interested in Water-Works construction and maintenance, and will be of great value to Water-Works superintendents and projectors of new works.

Superintendents of water-works and water companies will wish to see correct and complete data concerning their Works in our MANUAL, and to ensure this they should send in reports *at once* upon the blanks which we have already sent to every Water-Works office in the United States and Canada. Many have delayed their report, and if the blanks we intended for them have been lost in the mail, or mislaid, we will send more upon request.

We *must* have a report from every public water supply system in North America, so those who reply to our inquiries at once will save a second inquiry. We also wish to know of *every* new Water-Works plant in process of construction, and of *every* new project in this line. We will send to any one desiring them, blanks upon which reports can be made.

Further details of the MANUAL will be advertised later. We abstract from our special reports for the MANUAL the following items of current interest:

SHELBURNE, Ont., Nov. 27, 1888.

EDITOR ENGINEERING NEWS:—The Ontario Pump Co. is building a small system of water-works to be owned by the village, having begun work to-day. They have the contract for masonry and foundations, buildings and pumping machinery. The other contracts have not been let. Water is pumped from a well to a tank by a 25,000-gall. Curtis pump driven by a Halladay wind-mill. The tank is of wood, 30 ft. in diam., 20 ft. high, and has an elevation of 100 ft. There will be ½ mile of 8-in. pipe and 7 or 8 hydrants. The cost will be but $800. Population, 1,300.

F. G. DUNBAR, *Village Clerk.*

CANASTOTA, N. Y., Nov. 1, 1888.

EDITOR ENGINEERING NEWS:—The new water-works at Avon, N. Y., just completed, were tested and accepted by the village on Nov. 23. They were designed by E. D. SMALLEY, of Utica, N. Y., who was also Constructing Engineer. The works are upon the gravity system, the source of supply being Conesus lake, situated 8¼ miles from the village. The water is taken into the pipes at a point 16 ft. below the surface of the lake, and 1,300 ft. from the shore, through wrought-iron pipe. It then passes through 1,800 ft. of Wyckoff patent pipe, laid along the shore of the lake to the outlet, where it enters a conduit of vitrified tile, 1¼ miles long, laid with Portland cement and oakum joints.

From this conduit the water is conveyed to within 1¼ miles of the village in Wyckoff patent pipe, and thence by cast-iron pipe to the village. There are about 5 miles of cast-iron distributing pipe in the village, and 35 double nozzle hydrants. At the junction of the Wyckoff and cast-iron pipe outside of the village is a reservoir of 5,000,000 galls. capacity, to be used for fire purposes only, the water for domestic use flowing directly from the lake to the village. The bottom, and the lower half of the sides of this reservoir is lined with 6-in. free stone, and the upper part of the side puddled and paved with field stone. Midway between the lake and the village, the water passes through a wrought-iron pressure filter filled with coke. The filter is double and self cleansing, by reversing the flow of water in each side alternately. There is a difference of 120 ft. between the highest and lowest hydrant, and from 60 to 114 lbs. pressure respectively. No pressure reducers are used, but the system is fully supplied with automatic air and relief valves. The hydrants will throw water over any of the adjacent buildings, and furnish full fire protection for the village. The cost of the works was $60,000, and they are owned by the village. Brown & Doyle, of Mohawk, were the contractors for the work, and Orange Sackett, of Avon, is the present Superintendent. E. D. SMALLEY.

COXSACKIE, N. Y., Nov. 26, 1888.

EDITOR ENGINEERING NEWS:—In answer to the question contained in your circular of Nov. 24, a general statement will suffice.

Some two years ago a gentleman of Flatbush, N. Y., purchased a site for the construction of a system of water-works, to supply Coxsackie with water for fire protection and for drinking.

Some preliminary surveys and levels have been made by myself, and besides and beyond that nothing has as yet been done in the prosecution of the enterprise. What the owner's intentions are, I do not know.

R. H. VAN BERGEN.

CAMBRIDGE, O., Nov. 23, 1888.

EDITOR ENGINEERING NEWS:—The town has voted to put in water-works. R. T. Scott can tell you anything you may want to know.

FRANKLIN, Ind., Nov. 30, 1888.

EDITOR ENGINEERING NEWS:—We wish to let a contract for water-works by Jan. 1, 1889. water to be pumped from wells on stream to stand-pipe, a company to put in and own the system. We do not wish to peddle the contract if we can make a satisfactory arrangements with a reliable company to do work. FRANK MCCOLLOUGH.

GREENSBURG, Ind., Nov. 28, 1888.

EDITOR ENGINEERING NEWS:—The construction of water-works was begun July, 1888, but hardly anything has been done. The works were designed by E. F. Fuller, New York City, and Geo. C. Stevens was to be constructing Engineer. Sam'l. R. Bullock, New York City, has the franchise, and let the contract to Bussell & Craig, Greensburg. Water will be pumped directly to the mains from a reservoir on a stream ½ mile from town. The reservoir will have an estimated capacity of 20,000,000 galls., and there will be two 1,500,000-gall. pumps. There will be 7½ miles of cast-iron mains, 100 hydrants, and the services will be of malleable iron. It is hoped that work will be resumed soon. NATH. P. HOBART is President and CHAS. M. BERRIAN Secretary of the Greensburg Water Co. Population, 4,000. J. W. CRAIG.

FRANKFORT, IND., Nov. 23, 1888.

EDITOR ENGINEERING NEWS:—The Council wish experts to look over the ground, make estimates and bids on a system of water-works, for which the village has voted $10,000 of bonds. Two railroads are coming here next spring, and we will build works then.

CHAS. BURMEISTER.

SOUTH BOSTON, Va., Nov. 27, 1888.

EDITOR ENGINEERING NEWS:—Our population is about 2,000, and the village proposes to supply it with water by pumping from Dan river to stand-pipe. An appropriation of $20,000 has been made, and contracts will be let Dec. 10, '88. C. A. BALLOU is Engineer.

W. D. BARBOUR, *Chairman Water Board.*

WEST DEPERE, Wis., Nov. 24, 1888.

EDITOR ENGINEERING NEWS:—The works of the Artesian Water Supply Co. were put in operation Nov. 1, 1888, having been begun about a year ago. There are three miles of Wyckoff wooden pipe furnished and laid by the Michigan Pipe Co., Bay City, Mich. The services are of galvanized iron. There are now about 100 consumers. The contractors for the well were Gray Bros., Milwaukee, Wis. The franchise is for 25 years, and hydrant rental is $20 and $25. The capital stock of the company is $20,000. There are no bonds, but a debt of $2,300, without interest. W. A. BINGHAM is President and J. P. WILLARD, Secretary of the company. A. WILCOX.

PORTLAND, Mich., Nov. 29, 1888.

EDITOR ENGINEERING NEWS:—We have water-works on a small scale, for fire protection only. Pipe has been laid on the business street and a steam pump erected. We have been talking of putting in a complete system, but as yet have not decided on a plan. We have about 2,500 inhabitants, and if anything is done it will probably be by the village. W. F. SELLECK, *Trustee of Village.*

RECORD OF NEW WATER-WORKS CONSTRUCTION.

(*Specially Communicated.*)

CONTINUED FROM PAGE 438.

Wahoo, Neb.—The works were designed and built and are now controlled by the American Water-Works & Guarantee Co., Pittsburg, Pa. The contractors were as follows: for pumping machinery, trenching and pipe laying, M. Walker, of Fenton, Mich.; for valves and hydrants, Ludlow Valve Mfg. Co., of Troy, N. Y.; for pipe and specials, New Philadelphia Pipe Co., of New Philadelphia, O. The supply is taken from the Wahoo river and driven wells, and pumped direct by a pump of 200,000 galls. daily capacity. There are 6½ miles of pipe and 43 hydrants; the mains are of cast iron, and the service pipes of galvanized iron. Ordinary pressure, 40 lbs; fire pressure, 90 lbs. Cost of works, $63,000; debt, $60,000; rate of interest, 6 per cent. The works are managed by the Wahoo Water-Works Co. H. E. KERR is Superintendent. The present population is 4,000.

Chadron, Neb.—The works were commenced July, 1, 1888, and completed Oct. 1, 1888. They were designed by A. A. RICHARDSON, of Lincoln, Neb., and P. M. PRITCHARD was Constructing Engineer. The former supply was brought in water wagons from springs 1½ miles distant. The new supply is taken from Chadron creek, 3 miles distant, and pumped to a reservoir 100 ft. diameter by an engine with a daily capacity of 1,500,000. Fire pressure, 120 lbs. Cost of works, $35,000; rate of interest, semi-annual, 6 per cent. Hydrant pressure is used for fire purposes. The works are owned by the city, which has issued bonds for $35,000. Chairman of Water-Works Board, ROBERT HOOD. The present population is 3,200.

Crete, Neb.—The works were commenced in the spring, and completed in June, 1888. They were designed by ANDREW ROSEWATER, of Omaha, Neb., and the contract for construction was taken by A. L. Strang, of Omaha. The supply is taken from a system of wells and pumped to a reservoir with a capacity of 1,000,000 galls. by an engine with a daily capacity of 1,000,000 galls. There are about 4½ miles of pipe, and 50 hydrants; the mains are 12 ins. diameter and the services 8 and 6 ins. The cost of the works was estimated at $35,000. The franchise is for 25 years, and the hydrant rental is $60 per annum each for 50 hydrants. The present population is 2,800. F. D. WILLIAMS, is City Clerk.

(TO BE CONTINUED.)